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

NOVEMBER 1989 £2.95

CD PLAYERS

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BUYER'S GUIDE

STEREO TELEVISIONS

10 HI-TECH TVs
ON TEST

BEST BUYS AWARDED

WE CHOOSE
THE BEST BUYS
AND RECOMMENDED
PRODUCTS

ISSN 0955-1115

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CHOICE CUTS



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T H E M A S T E R S O F S O U N D

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

HI-FI CHOICE

ISSUE NUMBER 76: NOVEMBER 1989

EDITOR:

John Bamford

CONSULTANT EDITOR

Paul Messenger

ASSISTANT EDITOR

Jane Hadley

STAFF WRITERS

Daniel Houston, Jason Kennedy

CONTRIBUTORS

Martin Colloms, Paul Messenger,
Roy Gregory

ART EDITOR

Kerry Gornley

PHOTOGRAPHY

Chris Richardson

ADVERTISEMENT MANAGER

David Reynolds

ASSISTANT ADVERTISEMENT MANAGER

Daniel Roper

ADVERTISEMENT EXECUTIVE

Miriam Young

ADVERTISEMENT PRODUCTION MANAGER

Kathryn Balchin

ADVERTISEMENT DIRECTOR

Alistair Ramsey

PRODUCTION MANAGER

Judith Middleton

MARKETING MANAGER

Bryan Denyer

SUBSCRIPTION FULFILMENT MANAGER

June Smith

NEWSTRADE CIRCULATION MANAGER

Stephen Ward

PUBLISHING DIRECTOR

Marianne McNicholas

GROUP PUBLISHING DIRECTOR

Richard Howell

GROUP CREATIVE DIRECTOR

Tony Spalding

FINANCE DIRECTOR

Colin Crawford

MANAGING DIRECTOR

Stephen England

CHAIRMAN

Felix Dennis

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MENU

If you're confused over the current state of the art of CD player technology it's hardly surprising. Until recently manufacturers have been telling us that 16-bit digital processing is superior to 14-bit, 18-bit superior to 16-bit . . . in other words, the more 'bits' the better. What's confusing hi-fi enthusiasts now, of course, is the emergence of bitstream processing, a low bit technique employing multiple oversampling.

Some of the CD players tested in this issue, namely the Technics models which employ the MASH converter chipsets (3.5 bits with 256 times oversampling) are 'low bit' designs, while Philips' 1-bit players have yet to reach these shores. Ignore any reviews of a Philips bitstream player which you may have read in other hi-fi magazines: those 'reviews' are based on prototype lash-ups which are completely unrepresentative of anything which may appear in our shops next year.

As Martin Colloms states in this issue, the best CD players are simply the ones that sound the best, regardless of which chipsets they employ. As for 1-bit players, well, the proof will be in the listening – and we'll be reporting on them when they really are available!

Another 'new technology' which is bound to cause some confusion on our High Streets is NICAM stereo broadcasting for television sound, which is coming on stream in some parts of the country (on ITV stations) just as this issue of *Choice* goes to press. With the coming of stereo TV transmissions we thought it might be interesting to test a handful of the latest NICAM-ready TV sets. Where appropriate, we hooked up the audio outputs to a high quality hi-fi system – and, as we might have expected, not all TV sets sound the same. In fact this whole area of integrating stereo TV with a high quality hi-fi system is a minefield. Paul Messenger explains the pros and cons in this issue.

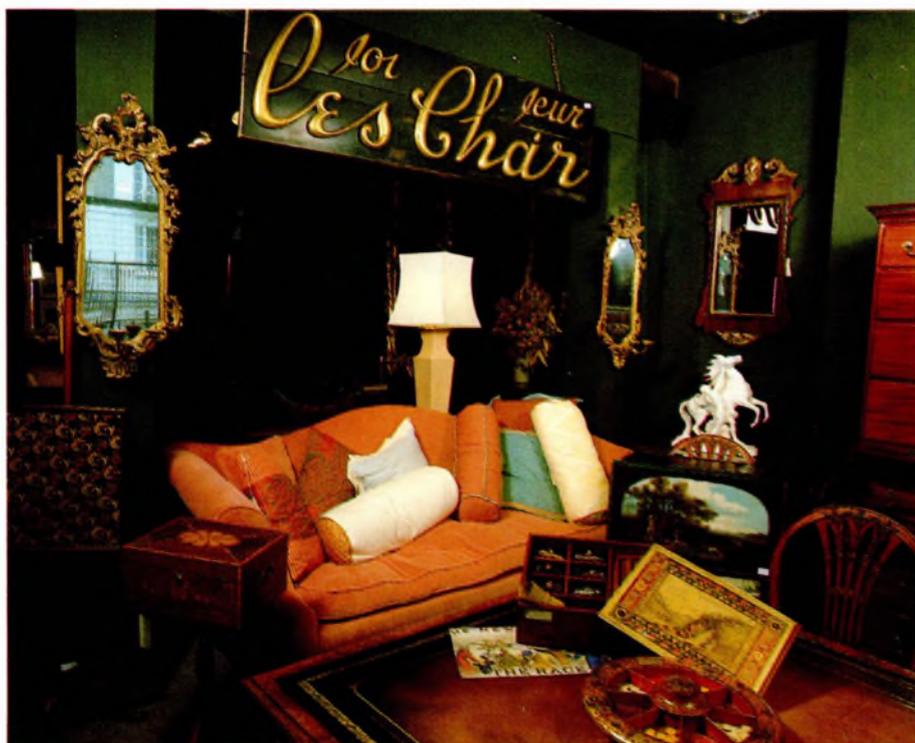
This month's *Choice* also includes the third in our series of free supplements for record collectors. This time *100 Choice Cuts* catalogues our favourite classical releases; in next January's issue we'll be rounding off the series with a fascinating compendium of rare rock releases, those albums which are generally regarded to be the most valuable collectors items. It could be time to start sifting through those cardboard boxes of forgotten LPs stashed in the attic. Some of them are worth a small fortune!

John Bamford



Cover photograph of the Arcam Delta 170 with the Black Box Mk II by Chris Richardson.

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Selling antiques to music (top): High Fidelity TVs (above) and a Symphonie in blue (right) are just some of the subjects covered this month.

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Dear Dierdre... There's no-one here of that name, but you can air your audio agonies on this page.

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PAYLESS QED

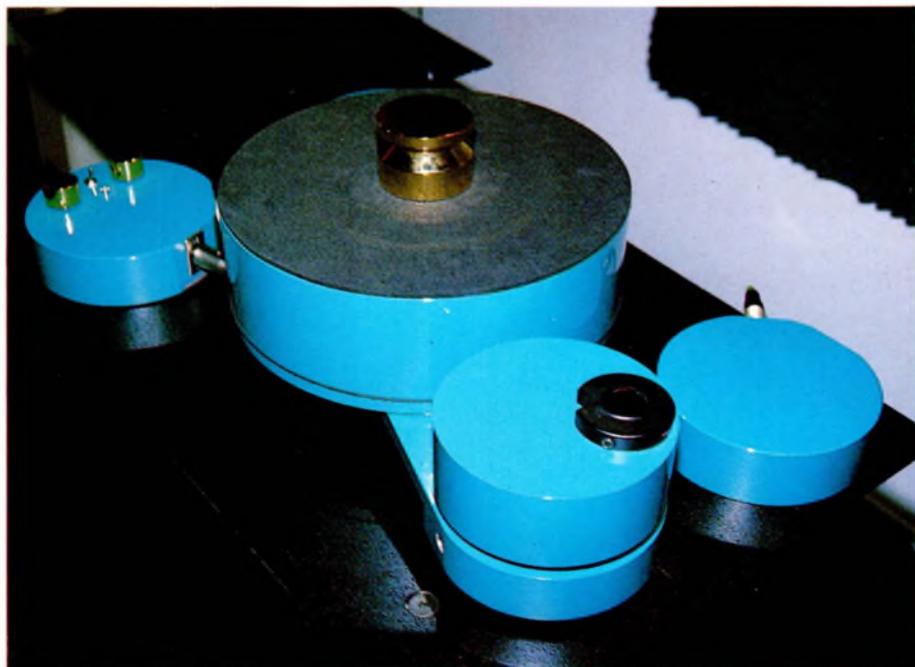
Dan Houston continues our reports on through-the-house systems, visiting an antiques shop wired for sound.

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TELEPERSPECTIVES

Paul Messenger has been living with ten of the latest large(ish)-screen televisions. Here he examines what's happening in this hi-tech field and what the buyer should consider before making a choice.





Tested along with 25 conventional CD players this Philips CD-video (singles) machine is recommended on both audio and visual counts. Bottom: the reviewer's eye view of the televisions. And right: we give away ten Appolo tables – turn to page 16 for the winners

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OPUS 3 COMPACT DISC OFFER

A *Choice*-discounted range of renowned Swedish recordings of classical, jazz and world music including the famous test recordings 'Dynamics' and 'Depth of Image'.

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DMP CDs AND WBT PLUGS OFFER

Save money on the range of DMP audiophile jazz CDs (they have to be heard to be believed), and cut down on interconnect costs with our special offer on WBT state-of-the-art plugs.

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Newsagents cannot stock more than this month's issue of *Choice* but you can catch up on other equipment we have reviewed using this page.

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THE CHOICE DIRECTORY

A comprehensive buyer's guide listing all the currently available products we have reviewed, giving comment, prices and value ratings.



BARGAINS!

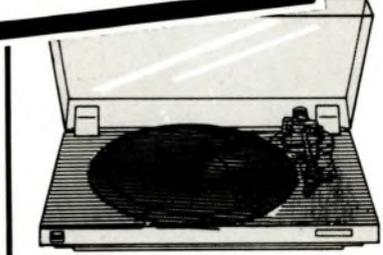
Some of this season's specials on scoop purchase and end-of-line product, all at our world renowned prices.

There are bigger and better deals than ever this month with both our annual warehouse clearance and containers of new goodies arriving at our stores daily. Remember, these are just a few of the amazing deals on offer so pop in and see us soon...



JVC ALE300 Turntable
Another budget beater from Richer. It's fully automatic, belt-driven and utilises a DC motor for silent operation. cart £5 extra.

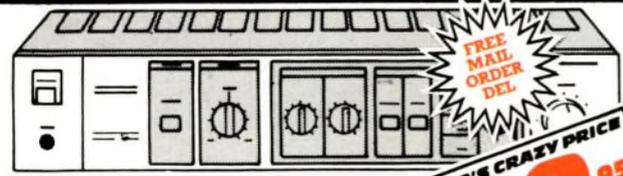
COUPON PRICE
£29⁹⁵



DUAL CS503.1 This high performance, low priced, impressively made German turntable brings new standards to the UK. Ortofon Cart only £10 extra.

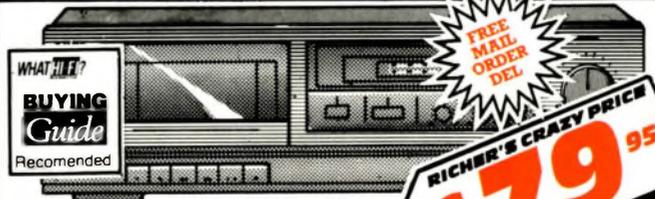
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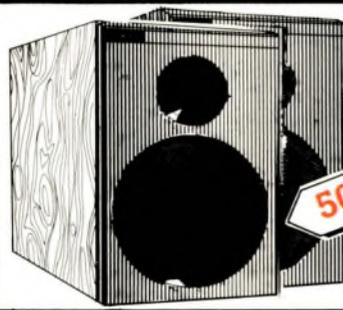
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RICHER'S CRAZY PRICE
£39⁹⁵



AIWA ADF270 Cassette Deck The professional's choice, for price and quality this deck's a winner: featuring Dolby* B&C, fine bias control and auto tape select!

FREE MAIL ORDER DEL
RICHER'S CRAZY PRICE
£79⁹⁵

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50wpc!
COUPON PRICE
£49⁹⁵ Pair



MARANTZ ST35L Tuner This attractive three-band tuner from Marantz's audiophile range includes the refinements you'd expect from a much more expensive model.

COUPON PRICE
£79⁹⁵

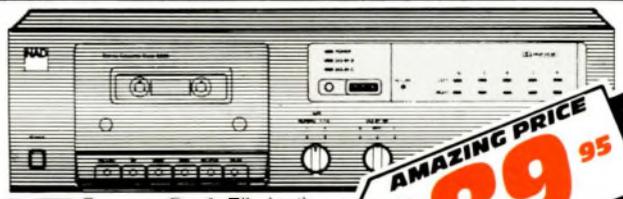
FACTORY REPACK

6 You can get some amazing bargains
What Hi-Fi? Magazine



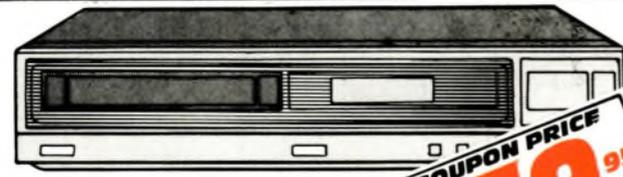
GOODMANS GSW5200 Cassette Deck At this price it must be stolen! No, bulk buying's the answer on this fantastic twin with high-speed & synchro dubbing.

COUPON PRICE
£69⁹⁵



NAD 6220 Cassette Deck Eliminating cosmetic frills in favour of spot-on performance this highly respected best-buy is a natural choice for the discerning audiophile.

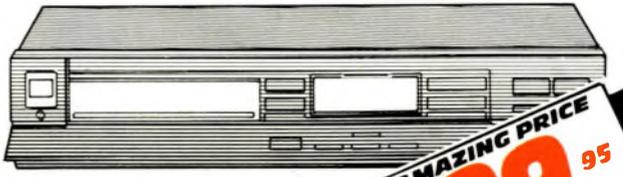
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SANYO CP17 Compact Disc An incredible deal that'll excite even the most dooby-down audiophiles after a hard days night. Throw a disc at it and allow it to seduce your ears.

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FACTORY REPACK



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Toshiba SR3648 All	£29.95
Aurex SRV34 All	£29.95
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Pioneer PL233 ST,LE,LB	£49.95
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Pioneer PLX230 LB	£49.95
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Thorens TD160S BI	£149.95
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Sanyo DCXW18 ST,CA,BR	£119.95
Hitachi HRDMD26 no 1 / LE	£119.95
Toshiba SL3047 inc.spkrs LE	£129.95
JVC W2 LE	£149.95
Sanyo S366 CA,ST,LE	£159.95
JPS 5900 CD ST	£159.95
Aiwa V770 inc.spkrs LE	£229.95
Aiwa X78 ST	£249.95
Marantz MX673 ST,LE	£249.95

TUNERS

Hitachi FTD100 BR	£49.95
Sony STZ95 SW	£69.95
Marantz ST360L CA	£69.95
Philips FT566 CA	£79.95
Dual CT7030 YO,LE	£79.95
Onkyo T4130 LI	£89.95
Harman Kardon TU911 LB	£119.95
Marantz ST64L SW	£159.95
Pioneer F91 BI	£199.95

EQUALISERS

Akai EAM20 LB	£29.95
Akai EAM77 ST	£39.95
Fisher EQ276 SW	£79.95

RECEIVERS

Fisher TAM24 YO,ST	£69.95
Marantz RX263 LB,YO	£79.95
Hitachi HTA D30 ST	£89.95
Sansui RX1000 LI	£129.95
Kenwood KRA 57 SW	£139.95
Yamaha RX300 LI	£149.95

SPEAKERS

Fisher STEM48 damaged YO	£19.95pr
Kenwood LSK200II SW	£29.95pr
Hitachi SS50 SW	£29.95pr
Sanyo SXW40 YO	£29.95pr
Kef coda 3 ED	£59.95pr
Videotone DC2580 LI,ED,CA	£99.95pr
Interfunk IF2120 CA	£99.95pr
Technics SB3670 LE	£119.95pr
Quart MB280 BI	£199.95pr
Quart MB610 BI	£299.95pr

MISC

Akai MM77 Mic mixer ST	£49.95
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Hundreds of items to clear at crazy prices. See codes after model num or for location of item: All = All branches; BI = Birmingham; BR = Bristol; CA = Cardiff; ED = Edinburgh; LE = Leeds; LI = Liverpool; LB = London Bridge; SW = Swiss Cottage; ST = Stockport; YO = York. These items were in stock on 18 / 9 / 89 and are sold at pile 'em high sell 'em cheap prices on a first come first served basis. Please phone the branch indicated to check stock if making a long journey.

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FREE MAIL ORDER	available from our Stockport branch (where indicated)

WE LOOK FORWARD TO SEEING YOU SOON!



UPDATE



PRODUCTS PENTA STOP PRESS

This year's London hi-fi show, sponsored as usual by *Hi-Fi News & Record Review* magazine and held at the Penta hotel next door to Heathrow airport, was as big as ever – with countless new products on display from manufacturers from all around the world.

The show was running just as this month's *Choice* was going to press, so a full report will have to wait until next month. Still, we just had time to pick up on a couple of hot stories and squeeze them into your November copy of *Choice*. As they say in the trade: the news as it happens . . .

Britain's premier loudspeaker manufacturers all had important new models at the show. KEF has launched a brand new version of the famous 105 speaker, now called 105/3 and looking like a taller version of 104/2 with coupled cavity bass loading and, not surprisingly, *Uni-Q* drivers for midrange and treble. Price is £1,690 and the demonstrations sounded mighty impressive. For the less well-heeled KEF has also developed a pair of coupled cavity subwoofers with internal crossovers for use with its C15 and C25 bookshelf speakers, priced £249.

Wharfedale has had a very

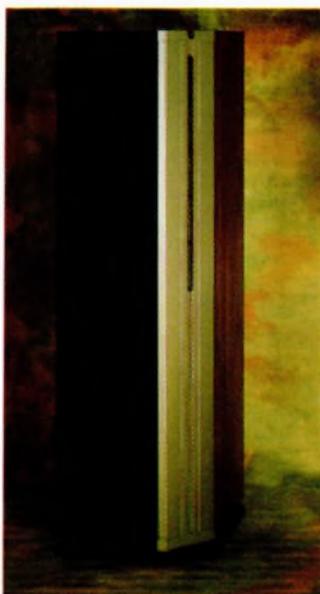
successful year with its affordable 505.2 speaker and is now launching two decidedly upmarket models: *Coleridge* (£499, available any day now) and *Harewood* (£699, available December). Both models feature beautifully crafted MDF cabinets with real wood veneers and down firing reflex ports, titanium dome tweeters with 89dB sensitivity and 200mm 'MFHP 2' bass/mid drivers with sturdy cast aluminium chassis. MFHP 2 is a new formulation of polypropylene cone material.

This year's marketing slogan for Celestion is "The Science of ART", ART standing for Acoustic Ribbon Technology. The fact that designer Graham Bank has been busy in Celestion's research labs for the past two years developing ribbon drivers appears to be one of the hi-fi industry's best kept secrets! The company has two new loudspeakers called 3000 (£699) and 7000 (£1,199), plus a 5000 model (£799) which is identical to the 3000 save for its real wood veneer cabinet.

In these new models, which are designed to be 'user friendly' and consequently should be positioned against a wall, the ribbon drivers are positioned along the inside corner of the cabinet at a 45 degree angle. Celestion's ribbon unit crosses over at 900Hz to an 8-inch polyolefine coned bass driver in

the 3000 and two 8-inch drivers in the more expensive floorstanding 7000 model.

The major talking point of last year's Penta show, you might remember, was the stunning theatrical design of the Roksan Engineering exhibition room. Roksan went to town this year too, and the company was previewing several interesting products including a new power supply for its *Xerxes* turntable



Roksan turntables over a tank of broken glass (far left), and new ribbon speakers from Celestion struck a stylish chord at Penta.

which has been designed to power both the turntable and an up-and-coming phono amplifier which can be housed within the turntable's plinth.

Further details on all this and much, much more in next month's full show report.



"A stately titanium dome?": The Wharfedale Coleridge aims to cater for the deeper pocketed.

RADFORD GOES DIGITAL

Woodside Electronics has launched the Radford *WSI* CD player. This 16-bit four times oversampling machine utilises the Philips *CDM1 Mk2* transport but all the electronics, from the digital filter onwards, have been designed by Woodside. Alas, it does not use valves.

To give credence to its \$995 retail price the *WSI* has an aluminium case and a 6mm thick black anodised fascia, which along with gold lettering sports a bypassable volume pot to allow direct hook up to a power amplifier. Both analogue and digital outputs are provided but the latter is coax only, not optical.

COUNTERPOINT HYBRIDS

Two new Counterpoint preamplifiers have arrived with Absolute Sounds. The *SA-1000* (£998) and *SA-3000* (£1,998) are hybrids that use tubes for current amplification and solid state devices elsewhere in the circuit (said to improve sound quality and extend tube life). The *SA-3000* features both MM and MC phono stages but for some reason these, unlike the line stages, have inverted polarity. It also embodies "over 50 design innovations" including the 'lead flywheel' power supply, incorporating FET, bipolar and valve techniques. The three tube *SA-1000* is a bit more down to earth, promoting itself Stateside on a value for money basis. Given its \$835 US price this doesn't seem so far fetched.

ALL CHANGE AT MARANTZ

Marantz is launching a flood of new products for the autumn, the new line-up including replacements for the top selling *CD65/II* and *CD75/III* compact

disc players. Insistent that existing models have not been redesigned simply for change's sake (which would be foolish considering UK dealers have been selling as many as they can get their hands on), the company appears confident that this year's new range will push the Marantz brand name from strength to strength.

At a special UK press conference, held in the delightful setting of Aviemore, Scotland, Marantz representatives took the opportunity to outline recent changes to the company structure and its relationship with Philips, Marantz's 'mother' company. We learned that a new regime took effect on January 1st this year, with Marantz now a marketing platform wholly separate from Philips. Whereas Philips branded products are intended to be more 'mass market', leaning heavily towards A/V entertainment systems, the future of the Marantz brand is believed to be in audiophile products. Philips appears to be allowing Marantz a free rein to get on with its own thing, presumably because Marantz management personnel are already seen to be doing a great job marketing components which have purist audiophile leanings.

This is all good news for Marantz which, in addition to having its own manufacturing facilities in Japan and its own research and development team, also has the advantage of being able to draw on Philips' R&D and manufacturing expertise whenever it wishes - and Marantz remains first in line for accessing Philips' key components (the latest premium quality chip sets, etc).

As well as announcing new CD players such as the *CD40* (a new 'cheapie' with full IR remote at £200), *CD50* (£250, replaces the *CD65/II*), *CD60* (£300, replaces the *CD75/III*) and *CD80* (£500, replaces the *CD85*), Marantz has a substantially modified version of the *CD94* to run alongside the



existing model, called *CD94/II* (£900), two new amplifiers and three cassette decks, and a new surround sound processor (*SB50*) which promises full Dolby Pro-Logic for just £199. And, of course, there will be *Special Edition* versions of the *CD50* and *CD60* compact disc players incorporating updated components and commanding a £50 premium.

To support the claim that Marantz sees its future in audiophile products, the company is re-entering the high-end audio arena with a new range of products dubbed *Music Link*. The first *Music Link* component is a 5ft tall floorstanding loudspeaker called *LS95*, a

Rhythmic 'pentameter'? All five feet of the new £3,000 Marantz loudspeaker - seen at the show.

prototype of which was seen at last autumn's Heathrow Penta hi-fi show. The design is now finalised and price is £3,000 per pair.

Marantz is also working on a state-of-the-art CD transport, *CD95DR*, which when finished might cost as much as £1,200. The company is emphatic that this high-end component will not simply be the transport half of the *CD12* two-box player, Marantz's current flagship.

VOLT KIT

Kit loudspeaker manufacturer, Wilmslow Audio has introduced a new high power model to its range. The *Volt Home Studio Monitor* is a 33litre (50.8 x 26.7 x 34.3cm) reflex design with high power handling and high 90dB efficiency. Low frequency extension is quoted at 30Hz and the speaker will, we are told, take the full unclipped output of a 200watt amplifier.

The drivers employed are a *Volt BM220.2* bass/mid unit and a Scanspeak tweeter. A split-circuit crossover is used which allows bi-wiring, and a full set of eight terminals is supplied for this purpose. Price is £329, plus £15 carriage. Wilmslow Audio can be contacted on (0565) 50605.

Replacing the mega-selling Marantz CD65/II, can the new CD50 better the record?



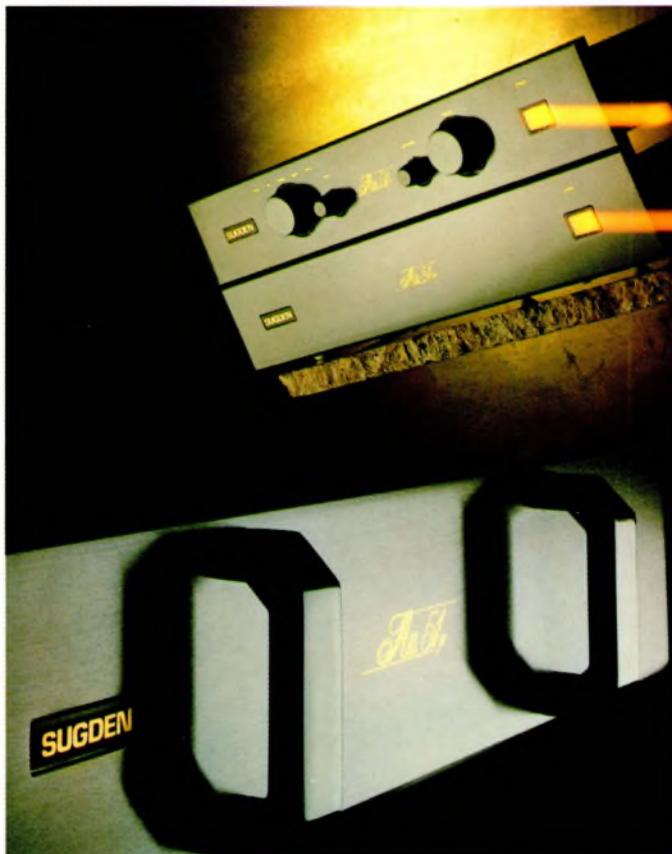


SOUNDS IN A CERAMIC STYLE

The Pearl and Oakley range of ceramic loudspeakers has been officially launched. First sighted at last year's Penta show these highly unusual loudspeakers have enjoyed so much success Stateside that their UK launch

has been delayed for six months. The *Cerca 2000* range is made up of six models, starting with the £199 *Hi 150* satellites and running up to the £1,099 three way *Victoria 200*. All *Cerca* models employ *Cercaflex* dishes to create omnidirectional sound radiation.

Apart from the sonic attributes



Pot music (left) is here after USA success; while ITL amps have been re-dubbed Aura (above).

of ceramics – high rigidity and low absorption – the *Cerca* range is very distinctly styled, with the vase like designs being welcomed by fans of invisible hi-fi and Victorian interiors alike.

SUGDEN BRANCHES OUT

A new company, Audio Synergy Ltd, has been formed to distribute Sugden products, whose range of Class A amplifiers has been supplemented by two new loudspeakers with a third on the way. These are the *CL*, a two-way compact with a rear firing port due to retail for £275, and the unusually named *Midlife*, a floor standing three-way with twin bass drivers that will cost £779.

There are also moves afoot to distribute a range of Dutch Class A amplifiers called Stemfoort. Specifics are still a bit vague but they sound expensive with the *LPA10* line input only integrated model due to cost £1,400.

THE PROAC RESPONSE

Proac has launched two new loudspeakers. Dubbed the *Response One* and *Two*, both models are heavily built near-miniatures. The *One* at \$899 measures 28 x 16.5 x 25cm (h x w x d) and features a polypropylene bass/mid driver. At \$1,599 the *Two* is a larger 46 x 23 x 26.5cm and utilises a 19mm tweeter and a 165mm polypropylene bass/mid driver in a cabinet made of high density 25mm thick material. The sensitivity of the *Two* is a lowish 86dB. The most unusual feature of both models is the use of a separately boxed external crossover – an undoubted aid to reducing distortion. A *Response Three*, which will be the largest Proac to date, is due out early next year.

Sugden is adding loudspeakers to its (solid) amplifier foundations. Right: 3 comes after 4 on Acoustic Energy's scale.

ITL IS DEAD: LONG LIVE AURA!

Portsmouth based amplifier manufacturer ITL, has been bought out by B&W Loudspeakers and re-christened Aura Designs Ltd, while retaining Michael Tu as managing director. The first model to appear under the new name is the *Aura VA-40* integrated amplifier, a 40 watt MOSFET design that will retail for £189. Physically the *Aura* resembles its predecessor the *ITL MA-80* which did well in *Choice* tests. A matching tuner is planned for an autumn launch.

ACOUSTIC ENERGY PLUGS THE GAP

Followers of the Acoustic Energy loudspeaker line-up may have noticed that so far the company has produced *AE1*s, *2*s and *4*s; so what happened to the *3*? The answer has arrived in the form of the three-way *AE3* which features a new 200mm metal cone bass driver and the aluminium mid and treble units found in the rest of the range. The *AE3* measures 63.5 x 27 x 37cm (h x w x d), has a lowish



efficiency of 86dB and a price of £1,500.

The company isn't content with just producing loudspeakers either – it's now distributing American amplifiers in the form of the Threshold and Forté Audio ranges. Threshold produces Class A/AB and pure Class A solid state pre and power amps with prices starting at £1,950 and slowing down around the £7k point. Forté Audio makes similarly specified components at more down to earth prices, including a preamp at less than four figures. Acoustic Energy is also distributing Acoustic Shadows active suppression systems for the control of LF resonances, along with Weber Wire cables.

BUSINESS



**ZEUS
Audio**

THE 1989 NORTHERN IRELAND HI-FI SHOW

About this time last year we got wind of a hi-fi show being organised by Zeus Audio in Belfast and decided to go along to see how this hi-fi thing is done over the water. As it turned out the show was very enjoyable, the relatively small size of the event enabling one to really study the hi-fi and to have a good listen in all the rooms without the usual crush that one finds at the bigger British shows. There was also a surprising amount of new equipment from previously unknown local manufacturers and distributors such as Audio Dimensions, distributors of Shan loudspeakers which did well in subsequent *Choice* tests. Alongside the locals there was a good showing by British companies which were making great sounds with the latest equipment. But perhaps the best things about the show were the people and the atmosphere.

This year *Hi-Fi Choice* and Zeus Audio are sponsoring the show together, and it's going to be even bigger and better. The list of exhibitors includes such notables as Audio by Design who will be lugging some awesome (and that's an understatement) horn loudspeakers over for the event and has a room that can do them justice. Gamepath will be playing its state of the art equipment including the new Oracle *Paris* turntable, a very hi-

tech Jeff Rowland preamp and the well regarded Infinity loudspeakers. Other impressive loudspeakers will be found in the Mission room where the new semi-active 767s will be in use along with *Cyrus* electronics. Competing with them in both size and sound quality will be the award winning *Mirage M1s*, innovative new bi-polar speakers from the USA and distributed by Audiophile products Europe.

On the source components front Oxford Acoustics has two new turntables up and running. Rotel has a new budget deck and Pink Triangle will be playing the limited edition *Anniversary* turntable. There's no shortage of CD players either with Ariston, Proton, Aiwa, Onkyo and Cambridge bringing along brand new machines and high-end players from Meridian and Micromega around the show.

There will be a wide selection of both affordable budget hi-fi and more esoteric equipment, and discounts of up to ten per cent will be offered on goods purchased at the show. There will also be seminars on audio technology by some of the industry's leading figures and all ticket holders are entitled to enter a free competition with over £3,000 worth of prizes to be won. Oh, and not to forget, there's never a shortage of the black nectar on the Emerald isle.

In short there will be something for everyone, from the out and out audiophile to those of you who merely enjoy music, Guinness, or the impressive grounds of Stormont itself. So come and join us!

The venue is again the Stormont Hotel, 587 Upper Newtonards Road, Belfast, on the weekend of November 3rd-5th. Show times are Friday 3rd – 2pm-8pm, Saturday 4th – 10am-6pm and Sunday 5th – 10am-5pm and a pass to enter for the show costs just £1.50 per day or £2.50 for the three days. For those of you near the Zeus Audio shop at Unit 6 Hope Street, Belfast, a bus will be leaving every hour on the hour to the Stormont Hotel during the show weekend.

PANUFNIK FOR TECHNICS LOVERS

Technics has been sponsoring performances of the works of Andrzej Panufnik to mark the composer's 75th birthday. In September London Musici under Mark Stephenson performed Panufnik's works at St Martin-in-the-Fields, Trafalgar Square. Later in the month Technics, in association with Conifer Records,



Technics' musical ties: Panufnik flashed by Mark Stephenson (right) of London Music and Alan Ainslie, Technics Marketing Manager.

planned to record a performance of three of Panufnik's works by the same orchestra at Snape Maltings, including the previously unrecorded Bassoon concerto. Technics professional DAT recorders were to be used to capture this event and Conifer will be releasing a CD of the performance in early 1990.

HI-FI FOR THE HIGHLANDS

The Scottish hi-fi and video exhibition is to be held from Friday October 20th through to Sunday the 22nd at the Post House Hotel in Edinburgh. The show will be the biggest yet with over 60 rooms choc full o' audio and video equipment. The Post House Hotel, Corstophine Road, Edinburgh.

THE DEFINITIVE MOVE

Brighton's Definitive Audio, stockist of Audio Innovations, Snell, Voyd etc, is moving. The new premises is located at Unit 8, Dyke Road Mews, 74-76 Dyke Road, Brighton. The new 'phone number is (0273) 208649.

An open day is planned for Saturday October 14th when visitors will be able to meet the designers of the above products, including turntable wizard Guy Adams.

ERROR CORRECTION DEPT

The ole word processor gremlins have been at work again; our apologies are due to both Cambridge Audio Systems and Cambridge Systems Technology. The name and address printed incorrectly on the Audiolab *8000A* review, in the September issue, should have been Cambridge Systems Technology Ltd, 26 Roman Way Ind. Est., Godmanchester, Huntingdon, Cambs PE18 8LN. Tel: (0480) 52521. And apologies also to Videotone whose address should have read 24 Oakley Road, Chinnor, Oxfordshire OX9 4HB. Tel: (0844) 54124.

SHOW REPORT

THE BERLIN FUNKAUSSTELLUNG

The Berlin Funkausstellung is the biggest event of the European hi-fi calendar, many would say the world. The exhibition site in Berlin is like a small city with 25 halls, a far cry from the hi-fi shows that we know in the UK. This is not just a hi-fi show, it's a 'fair', with live radio and TV broadcasts and regular concerts in the huge open air arena. Visiting the show is a fun day out for all the family.

Choice asked two correspondents to report on



Experimental digital satellite radio in Germany with Philips' FT990 tuner.

what was happening at Berlin: Rob Follis cf Hayden Laboratories had his camera at the ready and spotted all kinds of interesting consumer products (his report follows later), and Howard Woo, bossman cf Covent Garden Records at 84 Charing Cross Road, London WC2, picked up plenty of fascinating information on forthcoming hi-fi and video technology. First we hand over to Howard . . .

Philips held a major press conference at Berlin, where Jan Timmer, chairman of Philips Consumer Electronics division, unveiled the company's new products and discussed openly Philips' plans for the future.

As reported in last month's *Choice*, the worldwide recording industry and European and Japanese hardware manufacturers have agreed on a joint proposal for legislation to solve the DAT copyright problem, and in his speech to the press Mr. Timmer revealed that Philips intends to launch a DAT recorder in 1990. The machine will be in the high-end of the market and will feature the Serial Copy Management System, allowing once-only direct digital copies of CDs to be made in real time. (How exactly SCMS works could well make for an interesting feature in a future issue of *Choice*!) Philips did have a DAT machine called 880 on its display stand for international dealers, on the understanding that the company has the technology to produce machines and "Europe is ready".

As for recordable CD (CD-R), Philips says it acknowledges that copyright problems of a similar nature to those associated with DAT will arise with the introduction of such a product: "With the precedent of DAT in mind, we hope to resolve the copyright problem for this new technology . . . We do not intend to market CD-recordable or CD-erasable before the copyright issue is solved and before we have agreed a world standard for these products."

On the subject of CDV, Philips claims the product is taking "a long, but definite, road to break

TV design taken seriously: right, Blaupunkt encourages DIY fascias; Below, 'Porche Design' from Grundig.



Philips has new CDV players coming, including the '786 (above). Above right, prototype CD Interactive machinery.

through in Europe. The total world market for CD-Video players in 1989 is expected to be 960,000. Europe accounts for 60,000, the USA 100,000 and Japan 800,000. In Japan more than 7,000 CDV titles are available, in the USA 4,000 titles and in Europe around 300. The last figure is growing fast. We expect to have some 500 titles available in Europe by the end of this year . . ." *Choice* understands that agreements have been made for Sonopress and BMG/RCA to begin manufacturing CDV software.

As for future products, Philips has produced a digital audio satellite tuner (*FT990*), the German Bundespost having recently started DSR (Digital Satellite Radio) test transmissions for audio broadcasting on the Kopernikus satellite. Sound quality is claimed to be much superior to terrestrial FM radio, and the *FT990* tuner will be launched in Germany mid-1990. The company was also showing a new VCR (*VR 6880*) with a three-inch multifunctional colour LCD screen set into the front panel. In addition to showing the status of the VCR, the LCD can operate in television mode, showing the current TV picture, and there's a



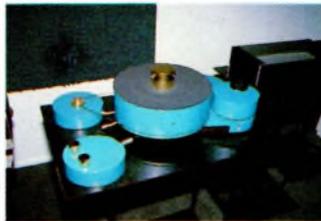
small on-board speaker too. So if you're really mean you don't need a TV set, just the VCR!

Philips has also developed an experimental VCR for HD-MAC recording as part of the Eureka HDTV research project. Equipped with a digital timebase correction facility, this experimental VCR can record and playback HD-MAC and D2-MAC signals in addition to PAL, Secam and NTSC. Playback time is 1hr 20mins.

Philips' CD Interactive (CD-I) system, which JB described in his report from Chicago's Consumer Electronics Show in last month's *Choice*, is seen to be an important development for business in the '90s as the applications in the fields of entertainment, education and information are endless. As ever, the success of the CD-I format (which is fully compatible with existing CD technology) will depend on the availability of software in the coming years.

Finally from Philips, but arguably the most important topic to be discussed at Berlin, is the domestic digital bus known as *D2B* (pronounced 'de-squared-bee'). *D2B* is a data communication/control system for all consumer electronics products which Philips would

Below left: no, it's not a pair of Krells - it's a Sanyo rack system! Below: the world's first turquoise turntable?



Ogon speaker suspended in Perspex (above); and below left, T+A's active speaker uses valves (!).

like the worldwide manufacturing industry to adopt so that the consumer of the '90s can benefit from inter-brand compatibility. Just imagine: if the industry adopted *D2B* then in the future you could operate your TV set's picture-in-picture function in combination with your VCR tuner using the TV's remote control handset - regardless of the type or brand of VCR. If all the gadgets around your home spoke the same *D2B* language, futureworld would be an easier place to come to terms with! The international electronics commission (IEC) has unanimously adopted *D2B* and official publication will take place early next year.

Interesting products on show included a new CDV combi player from Pioneer, the *CLD-1400* 18-bit machine with 8x oversampling; Grundig was showing a DAT recorder (model *909*) which employs bitstream processing, and Panasonic was causing much excitement in the industry with its *NV-L28* dual format digital VCR capable of playing PAL and NTSC tapes. Of course, when (and if) these products reach these shores is anybody's guess. Watch this space!

Rob Follis explores the show

Two contradictory traditions played their part in Berlin over the Audio Fair weekend. The first one, as anyone who has ever been to a hi-fi show knows, is that while you are in the show the sun outside shines all the time - and stops when you emerge! The other one, of course, is that it always rains on the August bank holiday. In Berlin this year, the August bank holiday won, the brilliant summer turned to humid grey, condemning the 450,000 visitors to a sweaty struggle from stand to stand.

Design

Design came into its own for '89, the stylish new products shown in Tokyo in late '88 now arriving in Europe. And local companies are fighting back with ever more interesting products. Grundig in particular was showing much flair, belying its staid image in the UK, exhibiting everything



Portable DAT players abound: models from Hitachi (above), Toshiba (right) and Aiwa (below).



from 'Porsche Design' TVs to handmade valve preamps to active digital loudspeakers. And in an effort to break the mould of routine design and come up with something different, Blaupunkt held a competition at the College of Design in Offenbach. The result is the simplest and most brilliant design idea at the show, a 21-inch TV with interchangeable front panels. Instead of being stuck with last year's black and chrome TV you can update the *Altro* set with the latest Blaupunkt panel, or buy a 'blank' and spray your own.

Hi-fi as art

The German end of the hi fi exhibition hall had the hushed reverent atmosphere of an art gallery. The Symphonie Line turntable was attracting a huge crowd; it may have been incredibly solid and inert with a Papst thread-drive motor, the performance might have been staggering, but what stopped the crowds was the colour – here was the world's first turquoise turntable!

And taking isolation to the ultimate, the Ogon loudspeaker box is suspended inside a Perspex frame by two huge chromed coil springs. The visual presence is remarkable, the audio results questionable. Certainly the opposite of a Foundation stand, one would expect the speakers to swing in time with the bass . . .

Japanese style

Sharp excelled itself with a remote control midi system that looks like a pair of Krell power amps. The *U10H Space System* features a four channel surround sound amplifier, CD player and tuner in one box with a twin cassette deck in the other, with astonishingly macho styling. Hedging their bets, the engineers have used the same guts in a four foot tall ebony black tower system complete with sub-woofer and also in a curvy grey designer midi. As the Sharp catalogue says, "better sound, better lifestyle". Er, yeah . . .

In Japan most audio products come in coats of many colours. Sanyo is extending the principle to video, with the stylish *Mini S1* 8mm camcorder, available in six

colours. Technology is not ignored and the *S1* has all the latest gadgets including a 470,000 pixel CCD, 6-times zoom with digital autofocus and an electronic viewfinder. With all this it weighs in at only 900gm.

Digital Audio Tape

Now that copyright problems are fading, it seems likely that DAT will finally arrive on our shores. Most hi-fi companies had at least one mains machine on display, while some were rather more inventive. Toshiba's *XCPO1* mini-recorder was locked away behind glass, but will surely emerge as soon as competitors start selling machines. Digital in/out and mic sockets were visible and it looks like a Sony *TCD10* that shrank in the wash.

Claimed to be the smallest DAT player in the world, Aiwa's *HDV1* recorder is tiny and very, very covetable. Measuring 145 x 94 x 37mm and weighing just 610gm (inc batteries), it can be used on its own as a small playback 'Walkdat' and by plugging in the supplied A/D converter block it also becomes a fully fledged recorder, with analogue and digital in/out. An unexpected extra is the availability of a still video adaptor allowing the digital recording of video still frames,

B&W shows Matrix 800 flagship (right). Below: multi-bit or bitstream? At Berlin Philips seems to be saying "take your pick"!



Above: the 'laptop video' from Hitachi uses full-size VHS tapes and flip-up LCD screen.

pictures from IC card cameras and other video sources. Expected to arrive in the UK in October, the *HDV1* will cost a very competitive £499.

Hitachi was showing the portable *DAT88* under its up-market *LOD* brand. This model weighs 980gm without batteries and has a plug-in remote control, complete with digital in/out and microphone inputs. Showing confidence, Hitachi allowed visitors to play with the machine and the sounds produced were pretty good.

TV and video

Tube size continues to grow, Sony's 45-inch set upping the stakes on last year's 37-inch Mitsubishi. Who's got room in their homes for these monsters is another matter! The small lightweight LCD TV projectors shown by Sharp, Sanyo and JVC offer a rather more realistic solution to large pictures in the home.

The VHS world, unable to come up with a convincing riposte to Sony's Video 8 TV Walkman, has instead invented a new product. The 'laptop video' (we photographed a typical example from Hitachi) uses full-size VHS tapes in a compact player with a five-inch LCD screen. A great idea for kids in a car, but I can't see myself lugging



one of these on to a plane – and nobody's mentioning battery life. Sony in the meantime has announced a four-inch version of their Video 8 original, a rather more portable proposition.

Small liquid crystal display TVs are now commonplace, a number being offered as video camera monitors. Panasonic, being innovative as usual, showed a series of concepts that will eventually redefine the camcorder. All the models integrate a TV screen as the viewfinder, while the underwater versions are an object lesson in ergonomics.

Hi-fi . . . well, there was some

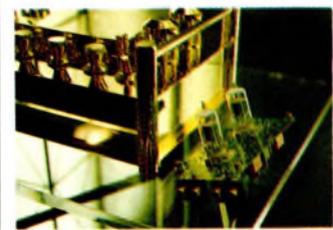
Linn Products, in conjunction with its German distributor, was making a very strong showing. The new Linn *Basik* turntable was on private view to dealers – and it certainly looked very basic. A £100 turntable from Linn? Well, fitted with the £150 *Akito* arm the *Basik* is projected to be selling for only £250 or so.

One of the strangest designs at the show was an active speaker with in-built valve amplifier! The T+ A Elektroakustik *Solitaire* has the amplifier suspended on a brass plate inside the top of the speaker. One assumes the valves are isolated from vibration, but it doesn't seem an ideal solution.

The B&W *Matrix 800* had its world premiere in Berlin and an impressive beast it turned out to be. With a UK price of around £5,000 and a height of over six feet, the '800 has to be one of the UK's most esoteric speakers. The visual design by Kenneth Grange at Pentagram is surprisingly elegant given the size, and on brief auditioning the sound was clear, precise and had excellent imaging.

Someone within the Grundig organisation has courageously given the small *Fine Arts* division a free rein to design a high end valve preamplifier. Finished in black metal and brass or genuine gold plate, and handmade in Grundig's own factories, the preamp uses *ECC83* longlife valves specially made by Siemens and is delivered in a wooden crate with velvet wrappings. White gloves are included for the installation. Price? Circa £2,000.

Grundig's Fine Arts division displays high-end valve preamplifier. It certainly looks the part.



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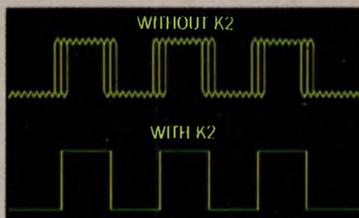
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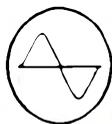
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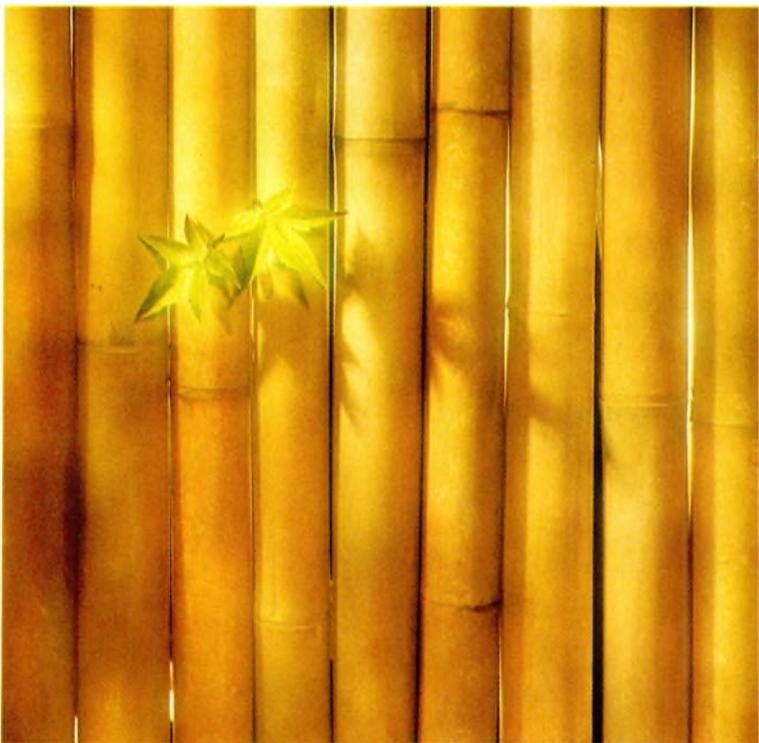
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Mhibui. It is a maple leaf growing through a plain bamboo fence; some small rusty rivets on a simple wooden door; an unmelted patch of snow upon a dark, thatched roof.

It is a bare, elegant beauty that the Japanese appreciate; a long-held belief that less really is more.

This is one reason why you'll find no surplus dials or LEDs on the Aiwa XA-007 amplifier.

It makes for a pleasant, uncluttered appearance, but the purpose is more than aesthetic.

Here's the logic: the simpler you can make an amplifier's circuits, the purer the signal, the cleaner the sound.

Not only does the XA-007 have a minimum of buttons and dials, but Aiwa have gone one stage further. A 'Direct' switch allows you to eliminate the Balance, Bass and Treble controls, when appropriate.

And the XA-007 features twin power supplies, which reduce interference between the pre- and power-amplifier stages and bring a greater sense of 'precision' to your music.

But, predictably, you won't find these mentioned on the outside of the unit.

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CHOICE SESSIONS

Things we hear . . . This month, the new integrated Series 400 from Audio Innovations and French-made Lectron power amp. Also, making music 'by Design', what happened at the Frankfurt show, and ten readers win Appolo AT1 tables.



APPOLO GIVEAWAY

Ten lucky readers will soon be receiving free Appolo AT1 tables. John Bamford picks their names out of the hat.

Keen hi-fi enthusiasts will doubtless have noticed that Townshend International recently introduced a go-for-broke version of the *Rock* turntable called the *Rock Reference*. Having procured one of these mega-decks for assessment (watch this space), I discovered that its not inconsiderable weight was more than my wall-mounted turntable shelf could take . . .

Enter Appolo's *AT1* floorstanding equipment table, which at £55 is one of the less costly specialist hi-fi tables around. It's fully welded and very neatly finished, with adjustable carpet-piercing spikes at the bottom and upward facing spikes to support the top shelf. The latter affords some degree of 'isolation' to sensitive record or CD playing equipment, while also allowing accurate levelling.

We were sufficiently impressed to twist the arm of Appolo's bossman into giving *Choice* ten *AT1* tables to give away to our readers. In the September issue we asked the simple question, "How many spikes are there on the *AT1*?" The correct answer, of course, was eight spikes – and out of hundreds of letters received at the *Choice* office, the first ten correct entries drawn from the mailbag on Monday 18th September were from:

1. D. L. Jackson, Blackpool, Lancs
2. Stefano Scannali, Stretford, Manchester
3. Eric McLelland, Cricklewood Broadway, London NW2
4. Jason Reid, Ayrshire, Scotland
5. M. C. Chapman, Torquay, Devon
6. E. S. Lewis, Manchester M14 6HX
7. S. Shah, Harrow, Middx
8. Nicholas M. Sketch, London SW16
9. Mrs. M. Wilson, Ferndown, Dorset
10. Christopher McFarlane, Newcastle NE1 4SG

Congratulations to the lucky winners; your Appolo *AT1* tables are on the way posthaste.

THE MISSING LINK

Audio Innovations has been producing Series 300 and 500 amplifiers for some time. Now they've plugged the gap with the feedback-free Series 400. JK listens.

Affordable and attractive valve amplifiers are at last beginning to appear on the market, and not surprisingly Audio Innovations, long time protagonist of the vacuum tube, is one of the main contenders in the market place. The company has recently introduced a bevy of competitively priced new models based on the same case and boards – *Series 200* pre and power amps basically being better specified separate versions of the integrated *Series 400*. Both offer a 12 watt Class A output and neither resorts to feedback, a qualification that separates the *400* from all other integrated amplifiers, be they tubed or transistorised.

The rather slick, crackle finish casing on the *400* is neatly designed and conceals considerable thought and attention to detail in its construction. Removing the rubber cap from one of the four cylindrical corner pieces reveals a complex alloy extrusion which connects up the two halves of the casework. The sieve-like appearance of the case's top half is necessary for heat to escape from the amp's seven valves, and it also lets dust in – but that shouldn't be a problem. One of the practical drawbacks with this, and for that matter all class A amplifiers, is that it's unwise to stack other components on top. The *400* also makes a plea for standalone status by virtue of its size/footprint, which because of the corner posts is larger than your average amplifier. However, like virtually all hi-fi equipment it will benefit from a dedicated support.

Mean, moody and dynamic: the Series 400 by Audio Innovations.

The graphics on the casing, which incidentally looks grey in direct light compared to the knobs and posts, are very faint, and at a distance only the company name can be made out. Apparently this is a deliberate move on the part of the designer (Graham Allen) and is intended to avoid drawing attention to the bottom of the case, thus improving overall aesthetics. The end result is quite stylish if rather dark.

On the facilities front this integrated model has a fairly basic line-up of four line inputs, a tape loop and an MM-only phono stage, the latter a shortcoming of virtually all valve preamps that can be easily overcome with some form of step-up transformer. However, because the *400*'s phono stage is so quiet it's possible to use quite low output MCs direct if you can live with relatively low SPLs.

Most of the listening was carried out using a Systemdek *11XE/SME IV/Goldring Excel* front end, with its output boosted by an Innovations *Series 1000* step-up device, whilst a Marantz *65SE* was employed to check out the line stage. Listening to this pentode amp over a couple of months the impressions that built up were extremely positive. It seemed very natural, relaxed and even sweet once it had warmed up for about 20 minutes or so. Another thing that struck me was its solid state like silence, making it more suitable than most tube amps for CD. A direct comparison with Innovations' *Series 1000/First Audio* triode amplification (costing around four times as much) revealed that the *400*'s apparent frequency response with Snell *Type III* speakers is a slightly light-weight bass and somewhat emphasised treble. In use this has the effect of highlighting the sense of air and space in recordings



as well as high frequency instruments like cymbals, whilst at the other end of the band bass extension is good but lacks power.

I had the opportunity to compare this amp with the *Series 500* which has a lot more welly but lacks the subtlety and finesse of its sibling. Apparently work is being done to make amends for this product line imbalance.

The *400* is a remarkable amplifier, and with the Snell *JTs* it sounds like it does a lot of the things that the excellent triode power amplifiers do. Imaging in both depth and height is precise, the dynamic range is superb and notes have a shape and 'life' that is very convincing. The triodes' main strength is a sense of ease and naturalness with which few amplifiers, if any, can compete, including of course the *400*. But it's still a very revealing and informative device, picking out lyrical subtleties that are obscured by all too many amps, one for instance being the sampled speech segments on B.A.D's *Medicine show*. Taken from obscure movies of the '50s and thus not the clearest of recordings, these excerpts are for the most part unintelligible with too many systems. This transparency is generally noticeable as instrumental coherence, – there's very little muddling or blurring so complex multi-instrument pieces remain clear and intact, each instrument or voice sitting in its own space in the soundstage.

Apart from its frequency response the *400* appears to have very little character of its own, and records or CDs for that matter are amplified in all their glory (or otherwise). Good ole analogue rock albums such as *'Zeppelin's Houses of the Holy'* really truck down, sounding tight and shapely at the same time. Reasonable CDs, such as those produced by *Opus 3*, are relatively compressed but image impressively and sound reasonably accurate at low frequencies. The slightly fatiguing quality of many discs is also present and in some respects the amp's tonal balance isn't very favourable to the digital medium. However, if it were matched up with efficient speakers that have a slightly downtilted-HF response the problem could be largely cured.

You note the word efficient, I trust; 12watts doesn't go very far with speakers that have a sensitivity rating of much less than 89dB or particularly low impedance. With the *JTs* which weigh in around the 90dB point it's possible to get pretty high sound pressure levels without audible clipping, not foundation rocking stuff but easily enough to whip the neighbours into a frenzy!

Overall the *Series 400* is both sonically and aesthetically an elegant device. We've not found another amplifier near its £575 price point that is as dynamic or transparent. There are plenty that have a flatter response and have more balls, but to a box they are more obviously distorted and less informative. Give your ears a treat, check it out.

VIVE LA FRANCE

Seen earlier this year at the Paris hi-fi show, Lectron valve amps are now available in the UK. Roy Gregory gets a taster.

That wonderful bunch of eccentrics, the folks at Electroactivity, will be new to many *Choice*



The cartridge stripped bare: MC10, Eminent and Xerxes

readers. Distributors by trade, they are responsible for the superbly named *Lead Balloon* turntable stand, and a pair of high rise *Quad ESL63* stands, both from Aricici in the USA. Additionally, they handle the GNP *Valkyrie* loudspeakers, an interesting modular design, of which much more later, and the subject of this little missive, the Lectron *JH50* valve amplifier from France.

Designed by Jean Hiraga (the man who brought you 'The Sound of Cables') the *JH50* has to be one of the tastiest pieces of hi-fi around. Rated at 25 watts/channel Class A, the symmetrical chassis runs two pairs of 6550 valves, and in some style. If those other French beauties, the *Jadis*, could be described as the amps that Bugatti would have built, the Lectron would sit more happily with Richard Sapper. From its brushed blue/grey body, to the high chrome block which backs (and reflects) the output tubes, this amp is all minimalist chic, georgously executed.

The sound doesn't disappoint either, and will be featured in an upcoming full review in *Choice*. However, at £2,300 this almost affordable slice of the high-end is just crying out for more specialist applications such as bi-amping, a situation which will make the

most of its sweetness and dynamic punch, whilst helping prevent it from outrunning its power output.

Even though this is my first contact with the Lectron I have a horrible feeling that it's going to be an expensive introduction. I'm going to have to have (at least) one... *Electroactivity can be found at 11 Muswell Avenue, London N10. Tel: (01) 365 3614.*

HEARING THINGS IN HARPENDEN

JK visits the home of one of the men behind manufacturers and importers Music by Design and listens to some silky sounds.

Last month director of Linx Products, Peter Crawford, invited me to his new house in Harpenden where he has the luxury of a dedicated listening room which doesn't have to concede to normal domestic limitations. I hitched a lift there with roving audiophile Roy Gregory, the main man on the road for Music by Design which distributes several high-end brands including Eminent Technology, Micromega and van den Hul, alongside the Linx range of electronics.

Peter's current home set-up consists of a luxurious piano black Roksan *Xerxes* sup-



Why can't we make amps that look like this? Lectron's JH50 stereo power amplifier.

porting an Eminent Technology tangential tonearm fitted with a rather naked van den Hul *MC10*. The cartridge body had been removed which is recommended sonically but which makes the cartridge somewhat vulnerable. The digital source is, of course a Micromega in the form of the top of the range *Digital* with the *Duo* outboard DAC, both rather attractive anodised aluminium creations from France. The amplification in use is Linx's *Vega* pre/power combo, nicely finished and simple looking solid state devices that are produced in Linx's Canvey Island factory by the original Kiwi team that started the company.

Linx's German distributor is the Audioplan loudspeaker company, while Music by Design is the agent for Audioplan in the UK. Peter uses the *Contrapunkt* which is the smaller of the two Audioplan models, a very compact unit with its own matching stand that can be filled with sand. In Germany it's nigh on impossible to sell shabby hi-fi equipment and the *Contrapunkts* reflect this in the way that the veneer used on the side of the speaker continues down the side of the stand. Although it's visually denser than a conventional metal stand the overall effect is of a piece of furniture that few houseproud hi-fi buyers would complain about. The cables throughout this system are also by Audioplan which one supposes works better than van den Hul in this context.

We played a variety of records including the wacky *Bob and Rays Stereo Showcase*, a highly collectable early stereo recording with excellent dynamic range and tonal accuracy. Another well cut disc was a Buddy Holly reissue that imaged with remarkable depth and scale, areas in which the *Contrapunkts* and indeed the whole system is at its best. The other impressive quality of these essentially small loudspeakers is their ability to plumb the depths of the frequency range. They don't shake the floor but they must hit the 60 or even 50Hz mark given the right material, which is no mean feat for a speaker with the internal capacity of something like a *Maxim!*

In a nutshell the sound was very smooth with good scale and depth, but to my ears which are used to the excellence in dynamics and naturalness that triodes produce, it seemed a little polite and lush. And to an extent Roy agreed, but apparently it's an area which the *MC Two* addresses.

We intend to make more in-depth assessments of these speakers and the amps in future *Sessions* pages, when we will really be able to get to grips with the nature of these beasts. In the meantime anyone who needs some loudspeakers that will complement their living-room should give the *Contrapunkts* a listen.

HIGH END '89: THE FRANKFURT SHOW

Courtesy of Audio Innovations, JK made it over to Germany's state-of-the-art hi-fi show. Here's what he found.

There's certainly no shortage of Deutchmarks in the strong German audio market, particularly for glossy and attractive products. In fact one gets the impression that the Germans like to show off their systems rather than hide them away. Consequently High End '89, the annual serious hi-fi show, held in the Gravenbruch Hotel outside

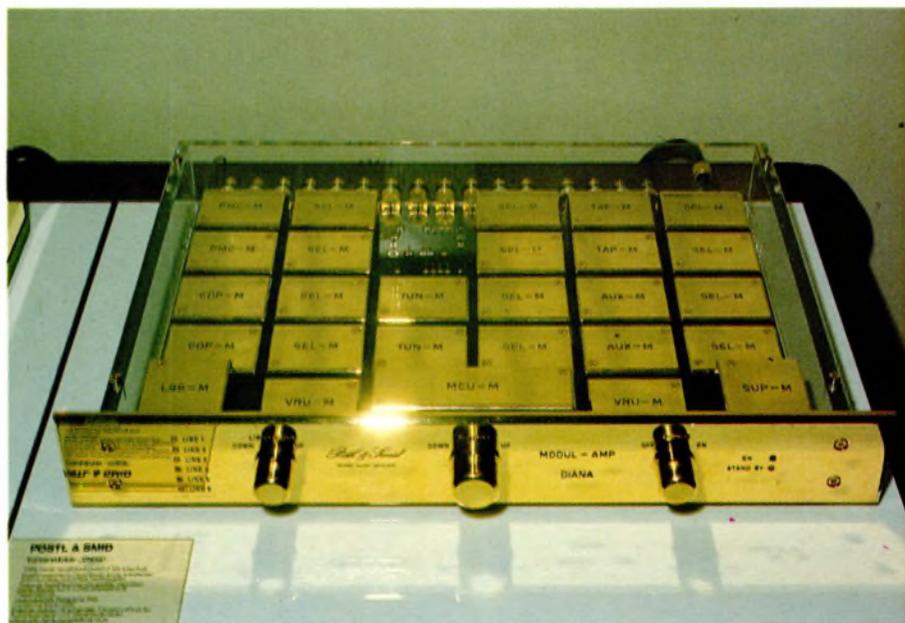


Frankfurt, is a tour de force of outrageously priced, and even more outrageously finished, products. Never have I walked around a show and been so surprised at the sheer 'over-the-top'ness' of the products. It was most entertaining, even amusing at times to see such bizarre objects conspiring to produce music.

However, the UK has lessons to be learned. It's difficult to imagine real hi-fi ever achieving any credibility outside the audiophile cocoon if it remains as dowdy and poorly finished as much UK-produced equipment is. But despite this, a fair amount of British companies were represented, some even bringing along new products, such as the *Series 200* and *400* amps from Audio Innovations, which must be the most elegant products to emanate from that source. Audiolab in its German Camtech guise was showing a tuner which, in Germany at least, is called the *T100* and features such luxuries as presets and AM reception. Joe Ackroyd had brought along the floor standing Royd *Apex* (\$485), which was being driven by the new style, remarkably neat looking Naim amplifiers. And there were plenty of other companies represented, but if they had any-



Top and bottom: the Postl and Smid approach to audio aesthetics. Middle: A'capella's distinctive 'horn' loudspeaker.



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OF HER LIGHT
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thing new to offer they were keeping stumm.

Products which will probably be seen in the UK included a bevy of new Sony *ES* components such as the *TA-NR1* and *TA-N 55* monoblok power amps, the former obviously designed to partner the top of the range *R1* CD player, a couple of preamps – *TA-E 1000* and *TA-E 77* – as well as a new DAT player, the *300ES*. Thorens was displaying a new concrete turntable called, rather unimaginatively, the *Concrete* which retails over there for the equivalent of £1,000 and looks almost low tech, although it's obviously well engineered.

But that's enough of real world products, what High End '89 was really about was chrome, Perspex and glamorous gramophones. The award for the most sci-fi turntable must go to the Transrotor *Quintessence*, £10,000 worth of chrome and gold plating that must take up a good square metre of table top and accepts at least two tonearms. Its closest competition comes from Postl & Smid which makes a whole range of extraordinarily expensive components, including blue and white record players and solid gold-look preamps.

This was a particularly good show for turntables (obviously the Germans appreciate the sonic supremacy of analogue) and the list of new names was unending with the more impressive ones coming from Brinkmann which is associated with Breur, Audiotech and Versa Dynamics. This last turntable is of American origin and formed part of the Audioplan turntable wars demo using what must have been the most expensive system at the show. The system consisted of Martin-Logan *Statement* loudspeakers, Jadis *JA500* monoblok amps (times four to give 2kw!) and the Jadis *JP80* preamp (apparently the more costly *JP200* preamp had 'gone down'). The other three turntables sent out to do battle were a Townshend *Rock Reference*, a Sota *Sapphire* and the Voyd, all being fitted with Sumiko *Virtuoso DTi* cartridges. Despite the relative, to price, lack of transparency of the system the Brits won hands down, with plenty of sales to prove the victory.

On the amplifier front there was no shortage of gorgeous valve creations including a host of new models from Lectron, a very nice integrated Copland, a new Airtight and the very shiny Kebschulls. But the most 'OTT amp of the show award' must go to Silbersand whose chromed pre and power amps were surely designed off this planet. Less bizarre but very slick was something called the Einstein, a high gloss (black for a change) integrated amp that's stuffed to the gills with capacitors.

There were, as ever, too many loudspeakers to take in, and aesthetics became the main arbiter. Most unusual was the Acappella with its three flared horns, but almost equally individual were the twin towers from Fischer which look like stacked cubes and contain a remarkable variety of drivers. Amongst the better sounding speakers were the US made Thiels and new Snell *C2s*.

Other interesting bits and pieces included the £3.5k Klimo *Ertanax* valve tuner which bears a striking internal resemblance to that vintage classic the Marantz *10B*. And Clearaudio, now without a UK importer, was playing the *Insider*, which is a rather well named new cartridge. I'm sure there must



Top to bottom: Transrotor Quintessence; Camtech (Audiolab) T100; Royd Apex; Air Tight ATM-2.

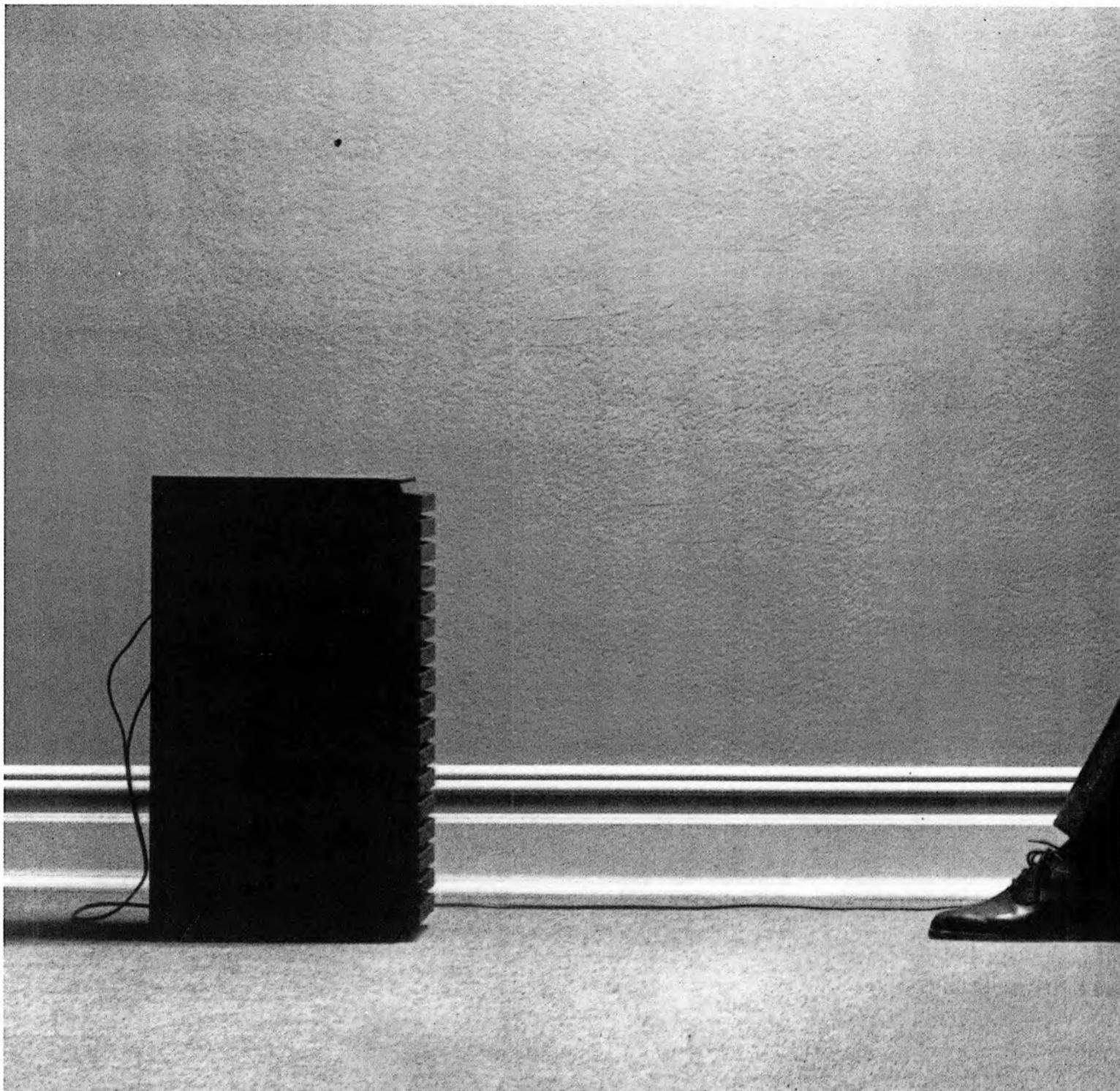
have been a few CD players around but the only one I recollect was a very expensive Luxman which was making quite remarkable sounds for a digital device.

Sonically, nothing really made me want to sit down and spend some time but, unlike most shows, by the end of the day my legs were worn out but my ears and head weren't complaining. It would seem that the characteristic German 'treble first' sound is on the wain and is being replaced with a CD-like flatness and civility – flat, that is, in both tonal and dynamic terms.

The High End '89 show was a fascinating event, and the overall impression was of better than average sound and excellent finishes. In fact when it comes to gloss, German hi-fi really is like German cars: smart, steady and very well made.



MAXELL'S NEW RANGE



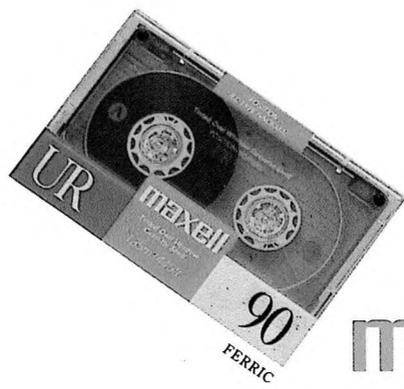
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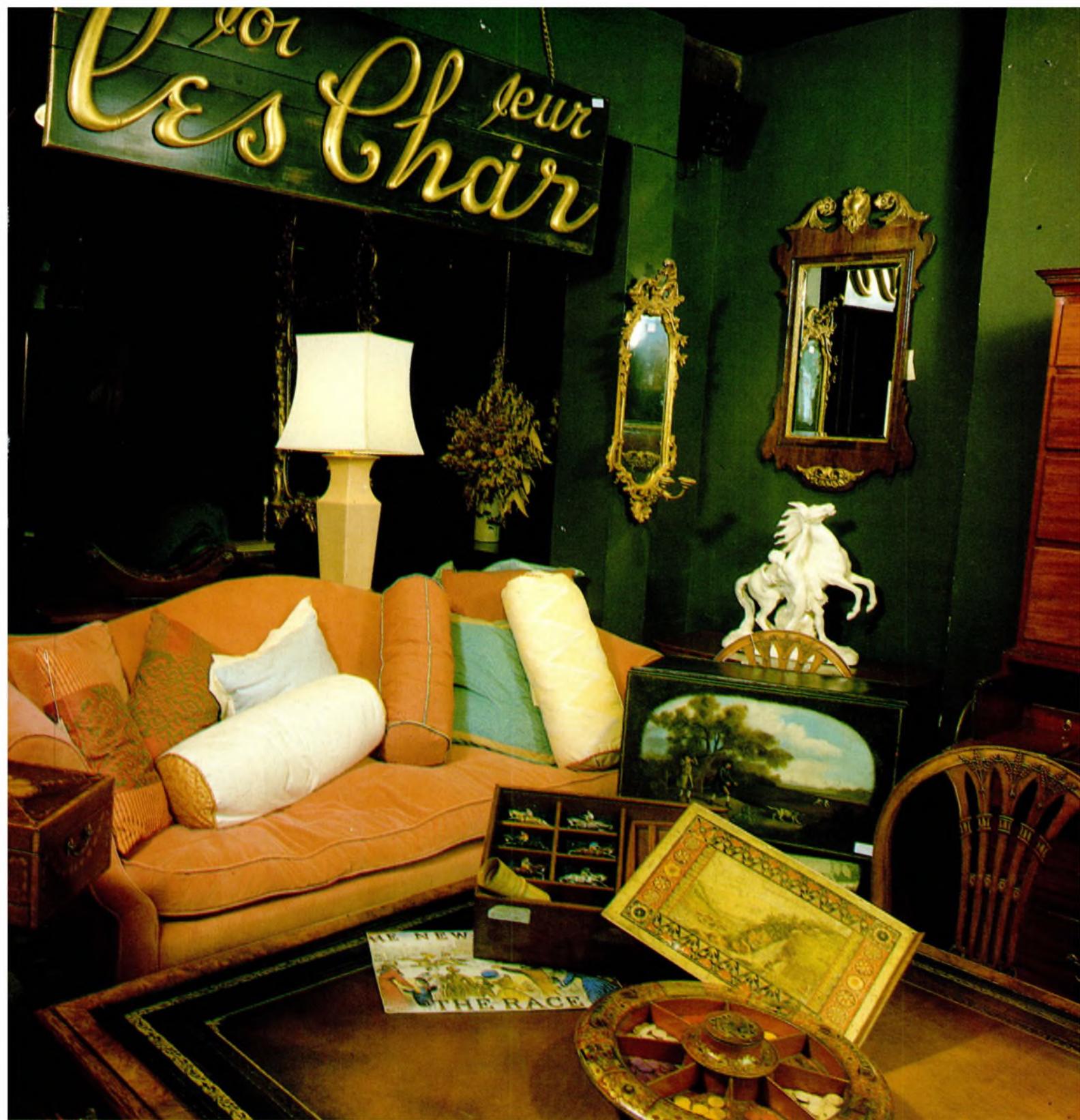
ASPIRATIONS

An antiques dealer wanted a sound system to relay music through his shop and home. The answer – QED of course! Dan Houston writes, Chris Richardson photographs.

Payless QED



This month we are covering a QED through-the-house installation which follows the Meridian and Revox setups we looked at in the last two issues. Through systems can be very expensive – the last two costing £17,000 and £15,000 respectively. This is a cheaper alternative – a mere \$4,000, but which nevertheless offers the same user-friendly appeal and flexibility with sound through three floors of an Islington antiques shop. “I think everybody’s going to have one of these in the future,” opined its owner and namesake, Thomas Kerr.



Stepping into the shop, in Theberton Street, is like stepping into a cluttered Dickensian parlour. The dark green walls and patina of polished wood furniture – walnut, yew, beech – create and feed the sense of old curiosity. It certainly seems like the last place to find evidence of a modern hi-fi system. The clocks and Chippendale mirrors reflect the lives of past owners who would have moved around this furniture to the tinkling tunes of a harpsichord or piano, or maybe just the rustling of a silk dress. It's a different image from that usually associated with hi-fi, which is

generally advertised as a necessary add-on to tubular steel chairs or pack-flat record-cum-book-cum-objet d'art whatnot cabinets.

The layout of the shop allows customers to browse through the different rooms. This being the Islington of 1989, rather than 1959, the typical TK customer tends to spend both a lot of time and a lot of money in furnishing their 'period' houses or offices. "People don't come to me for a spoon," says Kerr, "they come to me because they want a house full of antiques." On weekdays he lives above the

Left: Opening time sees the Alexanders switched on to relay the day's radio and music programmes. And above – shop window: "I'm just a second hand goods salesman," says Kerr.



QED's wall-mounted transmitter (above), which relays the infra-red sensors' commands back to the equipment. Below: Not being antique the hi-fi is tucked away under a staircase.

shop in a two-bedroom flat which is also full of antiques – many of the pieces sporting sales tags bearing testimony to their itinerancy. “This is only a kind of warehouse,” Kerr says, “I have a complete turnaround of goods nine times a year.”

The evidence of hi-fi is everywhere in terms of sound. But the diminutive brick-size Alexander 514 loudspeakers, wall-mounted high up on brackets, help to keep it visually minimal. “We had to put them where they would be out of the way of furniture, but I think they sound excellent where they are,” our host said. The equipment here is from different manufacturers and is relayed to the loudspeakers using the QED *System Line* which consists of infra-red sensors, control amplifiers for the five different areas and cable. Incidentally QED stands for Quality Electronic Design – not the mathematician's coda. Although the equipment is all upstairs the system can be run from anywhere in the building – one can switch from tape to CD (any track of five discs) or to radio and from station to station.

Kerr wanted something for both the flat and the shop. “I wanted it to be remote controllable but didn't want two systems. Listening to the radio all day long gets boring and this seems to have solved all the problems. I wouldn't describe it as a sales tool but it certainly helps to create the



atmosphere – customers often spend two or three hours here and music helps break down the ice. The place is less like a morgue and it also stops us going to sleep!" On his restorer's advice Kerr went to nearby Grahams Hi-Fi which offers the QED and Meridian through-house systems. He's very pleased with his acquisition: "They want £1500 for a decent car stereo these days, so I think this is very good value for money when you consider what it does."

The driving components for the system are housed in the flat; sound is relayed by the *System Line* which allows two different sources to be played simultaneously. "I can have Radio Three playing in the shop while I'm listening to a CD upstairs," said Kerr. The QED infra-red sensors and keypads in each room allow limited individual room control of the system, to turn the volume up and down, switch off and switch between a 'local' source and the main system. The QED control amp (based on the 240 model) has a phono socket to allow something like a *Walkman* to be plugged into that room's system. The keypads are 'stuck' to the wall with tabs of Velcro next to the sensor for easy location – but they can be carried in a pocket if necessary. More comprehensive programming is done with a £60 Onkyo universal remote control (*RC-AVIM*) which allows the user to switch between sources, change tracks, go up and down preset radio stations and to change from disc to disc in the Sony. As David Graham, the installer pointed out: "anything that can be done on a remote control can be done with this".

Situated upstairs in the kitchen/dining-room the main system, some £700 worth, manages to keep a low profile on top of a lady's dressing table under some stairs. The sources are a Sony *CDP C500* compact disc player capable of holding five discs, a Yamaha *KXR430* auto-reverse cassette deck and Yamaha *RX530* receiver. On top of the black stack sits the heart of the machine – the QED *SL-D (System Line Driver)*. Everything except the Sony sits on a Sound Organisation isolation table. Both the kitchen and lounge are driven by the main system – using the Yamaha receiver as amplification, the other four zones of bedroom, first and ground floors of the shop and the office are catered for by the *System Line* set-up which takes signal from the receiver's tape output to the *System Line Driver*. "That boosts the output so that there's no difference to sound quality when running long distance cables," David Graham explained.

As mentioned, the drive box can run up to five areas although there's no reason why two boxes can't be used for greater coverage. Each of these areas uses a control amplifier and infra-red sensor (*System Line Receiver*) to run the loudspeakers. *System Line* cables take signal to and from the driver box and rooms while QED 42 strand cable runs to the



speakers. Infra-red messages from the sensors are transmitted to the main system via QED's *System Line* transmitter, installed on the wall next to the system.

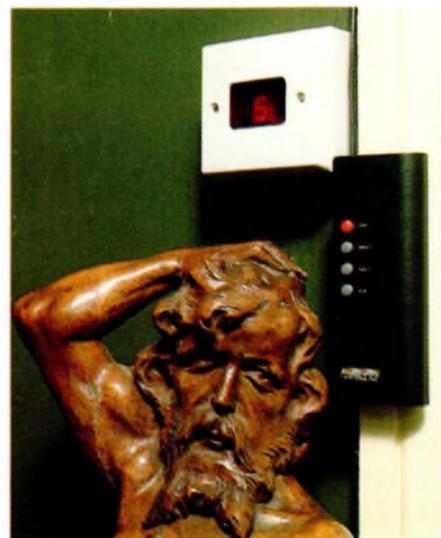
David Graham explained that the flexibility of *System Line* meant that a customer could upgrade and expand his system without having to install new equipment everywhere. "It's possible to add *System Line* on to your existing hi-fi to give through the house sound."

An installation like this would normally take Grahams three days. As this was one of the more complex installations it took slightly longer, with the company having to run QED's outdoor *System Line* cable down the outside of the building to the lower floors for aesthetic reasons. The installation of loudspeakers on brackets was also time consuming according to David Graham. However, he advised that this was not the sort of system to be installed by a DIY enthusiast: "once it's up and running it's quite straightforward but we're still on a learning curve with these sorts of installations".

If it's not a tweaker's delight, neither is this a purist audiophile system – for this money you could certainly make better music with a conventional source-amp-speakers set-up. But in this case that was not a requirement – and if Mr Kerr wanted he could invest in a better amplifier, source and loudspeakers and still have all the advantages of *System Line* through the shop. The big advantage of course is that unlike some through-systems the customer has far greater freedom of choice of components. One of the disadvantages of *System Line* is that it does not tell you what you are listening to; you have to know which key to press to change the source – the sensors merely relay track or preset radio station numbers.

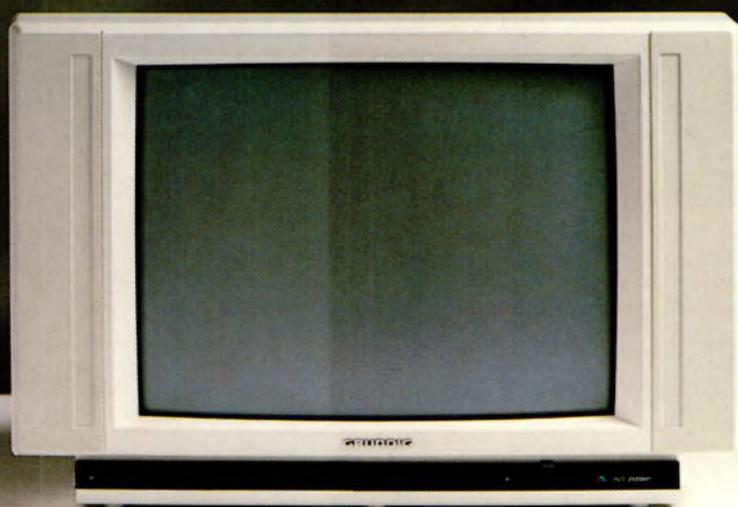
System Line is being improved all the time and future upgrades include a much better driver box to give eight different zones of operation (instead of the present two). But what is perhaps most important is that the price is not prohibitive to most people's aspirations – perhaps everyone really will have one of these in the future.

System installed by: Grahams Hi-Fi, Canonbury Yard, 190A New North Road, London N1. Tel: (01) 226 5500.



Top: The hip flasks – like a spirit level – confirm the stack of Yamaha, Sony and QED equipment is sitting horizontally; everything starts here. QED's sensor and Velcro-mounted keypad (above) have managed to fox this fellow who looks extremely like our own Paul Messenger.

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*Philips CD 840 available early 1990.



PERSPECTIVES

Colour televisions (CTVs), especially the bigger ones, are currently changing rapidly, driven by technological advances on several fronts. Providing background for the ten reviews that start on page 113, Paul Messenger takes a long hard look at what the latest CTVs are up to, and where they may be going tomorrow.

Teleperspectives

More than 90 per cent of households now have a CTV, and nearly 50 per cent actually have more than one, though there is usually one main large-screen, feature-rich model which takes pride of place in the lounge.

Nowadays low cost small screen sets (17 inches screen size and under) have actually started to outsell large screen sets (19 inches and over), as households add second and third sets in bedrooms and kitchens. But the large screen sets are the serious, advanced models that drive the market forward. For that reason I'm deliberately ignoring the small screen sector for the purposes of this article, save to note that they sell in large numbers at very low prices (thanks to Hong Kong/China sourcing), and are comparatively low-technology items.

Although the CTV has changed cosmetically over the years, in many ways the product has remained surprisingly under-developed – a TV is a TV is a TV, in total contrast to the world of hi-fi. Moreover, consumers seem happy to adopt the couch potato posture, showing comparatively little interest in discriminating between what threatens to become a depressingly uniform range of choice.

Familiarity may not have led to contempt as such, but has certainly resulted in the TV set being taken very much for granted. Accompanied only by aerial and power leads, and possibly a videorecorder (VCR), this icon of the 20th century squats at the focal point of the lounge, yet seems (at least superficially) to have evolved only slowly since the introduction of colour broadcasting 22 years ago.

However, winds of change are freshening fast. A decade ago the VCR provided the first alternative to the terrestrial broadcast duopoly, but its sub-broadcast quality made no particular demands upon TV manufacturers. Now we already have S-VHS and Hi8 camcorders (camera/recorders), CD Video and a variety of computer graphics programmes all capable of 'higher picture fidelity' than standard (PAL) terrestrial TV broadcasts. Satellite transmissions using higher quality MAC picture signals are just around the corner.

Broadcasters, hardware companies and even governments are drawing up battle lines for future 'higher definition' broadcasting systems, to bring a 'cinemascope' type experience into the domestic environment. Full HDTV is unlikely for at least five – and maybe even ten – years, but intermediate stages (Improved Definition and Extended Definition) are likely well before. At the recent Berlin Funkausstellung, Thomson announced it would be selling wide-screen (16 x 9 instead of 4 x 3 aspect ratio) CTVs by the end of 1990.

Arguably most immediately interesting, especially from a hi-fi perspective, NICAM digital stereo TV sound has been tested (and sporadically used) in the London area for more than a year. And the ITV companies are starting regular transmissions from September 11th 1989 from transmitters in London and Yorkshire serving 30 per cent of the population, albeit depending upon programme availability. By 1991 70 per cent of the population should be covered, which is around the time the BBC are expected to formalise their presently quite extensive 'experimental' NICAM transmissions.

Long term, NICAM will probably have a similar effect on the configuration of the TV set as the stereo LP had on the record player and radiogram – move it away from a single-box configuration and towards a hi-fi style 'component' layout, or alternatively move wholesale towards integrated audio/video systems. I'm not suggesting that this changeover will happen quickly, or even affect more than, say, the top quarter of the market. But the stage is now clearly set.

The fast evolving face of colour TVs – Ferguson's 51K5 with NICAM.



Given the above, anyone contemplating the imminent purchase of a television – which the average Briton does every seven years or so – would do well to bear in mind these various future factors. Indeed the future-proofing offered by the rental option – still responsible for 25 per cent of 'sales' in 1988 – is starting to look increasingly attractive.

TELEEVOLUTION

The ten sets gathered together for the group test in this issue are all complete units in the traditional sense – just add an aerial signal and you're away. But they also have noticeably more inputs and outputs than models from a few years ago.

Back at the beginning of the '80s, even the more upmarket set was a 'teak'-finished chipboard box, backed by ventilated hardboard. Teletext and remote control were in their infancy, the former commanding a very hefty price premium. Such utilitarian packages are still available today, but now only at the very bottom end of the market.

In contrast, the ten new review tellys we've assembled represent very much the cream of today's crop. All are black, have flatter, squarer screens and stereo-ready chassis. Enhanced teletext (Fasttext and sometimes other computer-controlled page memory systems) is the rule rather than the exception; eight out of the ten have NICAM digital stereo decoding circuitry; seven have on-screen remote control graphics.

For good or ill (I suspect a bit of both), large plastic extrusions make up most of the bodywork, while microprocessors and digital memories are well into taking over under the skin. The back panels sport SCART, speaker, and maybe audio in and/or out and Y/C (component video, for S-VHS and Hi8) socketry, besides the standard 75ohm aerial input.

SCREEN SIZES

Just as the sets have evolved, so has the marketplace, though which is driving which is one of the great imponderables. Where conventional large screen tubes consisted mainly of 20, 22 and 26-inch sizes, FSTs (flatter squarer tubes) are normally expressed as metric units, eg 51cm (21-inch), 59cm (24-inch), and 66cm (27-inch) – a usefully more even spread. Larger 'jumbo' sets in 32.3 and even 37-inch sizes are also appearing, at prices around £2,000.

Marketing analysis shows that the screen size bought by the British public is steadily, if slowly increasing – in marked contrast to the trend in loudspeakers over the past decade. One reason is probably that the adoption of precision moulded cabinets has allowed the sets themselves to shrink in total volume terms, so that a new 24-inch FST set actually looks no more bulky than the 22-inch of five years ago.

One surprisingly ill-publicised yet important finding from research into television viewing is that there are 'natural' viewing distances for different size and shape sets. The 4 x 3 aspect ratio of current television sets is most comfortably viewed from a distance 6 x H – six times the height of the set, whereas the 'wide screen' 16 x 9 shape envisaged for IIDTV is actually best watched at 3 x H, the much wider image creating greater viewer involvement.

I must admit I prefer to be rather closer than this, but it's a worthwhile formula for all that, and has a number of interesting implications. To save you having to work it all out (and assuming I got the conversion formula right), the 'standard' 51cm size should be watched from 6ft away, the 59cm models of the test group should be viewed from 7ft, 66cm sets from 8ft, and 78cm 'jumbos' from about 9ft 6ins. From which it is pretty safe to assume that most people in the UK probably have rather smaller sets than they should have.

The implications for IIDTV become positively alarming. A modest 6ft viewing distance implies a 125cm screen diagonal for 3 x H viewing of a 16 x 9 IIDTV. Projection rather than CPT (colour picture tube) TV displays could turn out to be the technology of the 21st century.

Back to the present, one of the reasons why FST technology has taken off so much more quickly in the UK and Europe than in the US (where it has only a third of the market) may well be to do with the Euro-

pean success of teletext, whose pages look significantly better on the flattened screen. And in some senses the growth of text-equipped sets is just part of the big swing towards remote control operation.

COLOUR PICTURE TUBES

Much as the reciprocating piston engine forms the heart of the automobile, so the cathode ray tube (CRT) is the central part of the television set. Not just because it is the most expensive and important part, but also because the chosen solution provides the optimum balance between conflicting requirements, despite possessing very real and unavoidable limitations. (Loudspeakers provide an equally pertinent analogy.)

The two most obvious rivals to the CRT for picture display purposes are projection TV systems and LCDs (liquid crystal displays). Both offer potential improvements in the geometry of the display surface (flatness or concavity being preferable to convexity), but each currently has even greater practical limitations, the former offering size at the expense of brightness, the latter lacking both resolution and size. So the vast bulk of the market for VDUs (video display units) of all kinds is based on the CRT. These come in a variety of forms, those used in CTVs being more precisely referred to as CPTs (colour picture tubes).

The ins and outs of CPT technology could fill a book, which, believe it or not,

Enhanced teletext is now the rule rather than the exception – testing at Sony UK's Bridgend plant.



would actually make very interesting reading. In outline it is a giant evacuated valve, with the inside surface of the faceplate covered in phosphor materials that emit light if bombarded by electrons. The electron guns sit down at the pointy end of the tube at the back of the set (explaining why big tellys are always so damned deep), squirting their beams at the inside of the screen as instructed by the control electronics.

It's in the nature of an electron beam to be attracted or repelled by magnetic fields, and to be effectively massless, and this enables a technique known as 'raster scanning' to be used to create a picture on the screen. The spot travels rapidly across the screen in a succession of lines, 625 of which go to make up the current TV standard picture. Controlling and varying the brightness of the travelling spots enables an image to be created.

Each complete scan is repeated 25 times a second, which is fast enough to kid the eye into seeing both a complete and a continuously moving picture. 25Hz would create unacceptable flicker, so in fact the European PAL TV system makes up each frame from two interlaced 312.5 line 'fields', raising flicker to a more-or-less tolerable 50Hz.

Monochrome tubes have a single gun to fire a single spot at a phosphor which glows white(ish). CPTs have three guns firing three spots simultaneously, at a faceplate with alternating red, green and blue phosphor stripes. These three primary colours can then be summed to create white(ish),

and enable any of the other intermediate shades of the colour spectrum to be created. Examine your telly screen with a microscope, and you'll see the little pixells of colours gathered in groups of three so that they merge together to give an integrated hue when viewed from a distance (honest).

PICTURE GEOMETRY

The earliest CRTs (cathode ray tubes), long before the days of colour, were really little more than an evacuated round-bottomed flask, with the gun placed in the neck firing towards a section of the base. This shape provides good strength to maintain the vacuum with minimum glass thickness, while the spherical section 'target area' can be made so that all points are equidistant from the gun, minimising beam focusing difficulties. However, straight lines become curves when displayed on a curved surface, and this is a form of optical distortion which has only really become acceptable because of the lack of any alternative.

Theoretically, from the viewer's point of view, the 'target' (screen) area should be as flat as possible, if not actually slightly concave (with all points on its surface equidistant from the eyes). Such a shape will not support a vacuum, especially over the area needed for the large screen sets, without using extremely thick (hence heavy and opaque) glass, which brings its own penalties in tow.

Tube manufacturers and setmakers have nevertheless found that the Euro-

pean consumer prefers – and is prepared to pay extra for – a flatter and squarer screen shape, even though purists can complain that FST tubes introduce greater geometric errors than the more conventional shapes. (As a generalisation, FST reduces the total distortion factor at the expense of less consistent optical distortion effects, especially towards the corners.)

Most of the FST tubes used in this issue's review group stick to curves which are spherical in origin, using as large a radius as possible and cheating a little around the corners. Notable exceptions are Sony's Trinitron tube and the Video-colour Super Planar used by the K5 Ferguson set.

The Trinitron is a Sony trademark, and can claim to be the original FST. Where most tubes have spherical curves horizontally and vertically, the Trinitron has a cylindrical section faceplate, completely flat vertically. The Super Planar is something else again, throwing out the spherical rulebook and using the latest CAD (computer aided design) techniques to create an aspherical shape a little like the back of a well stuffed envelope. This is certainly very flat indeed across most of the central section, if more sharply curved at the edges, and needs a complex gun/lens assembly to focus the beams.

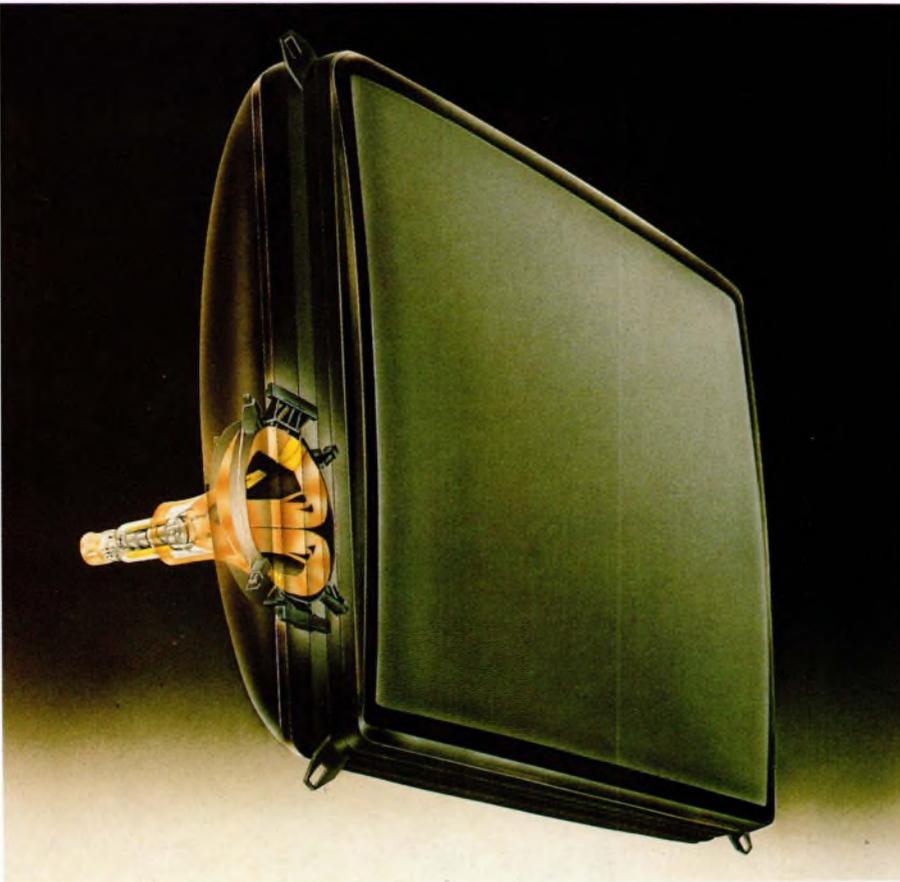
The latest Philips Components (nee Mullard) tube used in the Panasonic *Prism* CTVs takes a different route entirely. In order to give greater brightness capabilities and an enhanced contrast ratio, a thermally very stable (if expensive) alloy called Invar is used for the shadowmask, allowing the tube to be driven much harder than before.

Discussing the shape, brightness, resolution colour purity and what have you of the image displayed on the screen is only part of the tube story. The faceplate is also a reflector, to varying degrees, of the environment in which it is used. Not many people have fluorescent lighting in the lounge, but not many watch under black-out conditions either, and both room lighting and windows will all have an effect.

Flatness is certainly an advantage in reducing the total percentage of the room reflected to the viewer, but the various glass transmission and reflectivity factors constitute a very complex equation. Many of the best quality CPTs now use black 'lines' (or some similar term) as the guardbands between the different phosphor strips in order to reduce the reflectivity (of the inner surface of the faceplate seen from the outside), and so improve the contrast ratio (white versus black).

The convex faceplate surface, acting as a mirror, actually shrinks the image but widens the field of view at the same time, so that any source of light (either artificial or daylight) within a rather wider segment of the room than that which is suitable for viewing, effectively 'blots out'

Philips Black Line colour picture tube.



some part of the picture.

Careful siting is arguably the most important factor in maximising domestic picture reproduction (closely followed by correct adjustment of the controls, see later). But as with loudspeakers, the 'ideal' site may have to be compromised by other domestic considerations. The majority of the test sets reflect quite sharply defined images, but others have a more matt surface, and the Ferguson's Super planar tube has a very matt surface coating. To my eyes there's a trade-off here: the reflective surface is more disturbed by specific reflections, so works best under 'ideal' conditions; the matt surface is much more tolerant of specific reflections, but high non-reflective ambient light tends to raise its black level somewhat, reducing the contrast range.

A final word on reflections concerns the desirability (or otherwise) of an additional glass screen in front of the tube faceplate proper. This undoubtedly improves the aesthetics, and it reduces the influence of reflected light on the screen itself to a worthwhile degree. But it is also bound to reduce the available white level slightly, and also adds in its own quota of unwanted reflection effects, which will not coincide with those of the faceplate.

PICTURE ADJUSTMENTS

I have no intention of insulting the reader's intelligence by describing the action of bass and treble audio tone controls, but some clarification of the picture equivalents is long overdue, because their action is frequently misunderstood – which is why sets are often very badly adjusted.

Colour is pretty self explanatory and easy enough to set, but better left until the end for all that, as it only helps confuse the setting of contrast and brightness levels. In fact the colour element is an additional low-resolution signal known as chroma which is 'painted on to' the monochrome (luminance or luma) signal which carries all the detail.

Brightness and contrast are actually appalling names for these two vital controls, which go a long way towards confusing the issue. In fact, brightness controls the black level and contrast the white level, so you adjust each in turn to set the luminance range – analogous to the audio dynamic range perhaps. Obviously you want the brightness as low as possible and the contrast as high as possible to enhance the overall grey scale resolution of the set, though in practice it's a bit trickier than that.

The best procedure is first to make sure the ambient lighting is subdued, then take brightness but especially contrast way down so the picture is very dull, though the images are still visible. This is the best condition for adjusting the black level (aka 'brightness'), bringing it up slowly until the darkest parts of the picture

remain dark but detail variations therein can be properly distinguished. Having established the 'bottom end' of the luminance 'dynamic range', bring up the contrast until the brightest parts of the picture are as bright as possible, while remaining comfortable and stable. Then, just add colour to taste – not too much, and a little at a time.

This is a fairly rough and ready approach, but is usually pretty successful providing the basic programme source is of first class picture quality. If you can't be bothered to wait/get up for the BBC2 testcard, go for live studio broadcasts whenever possible.

You may find a fourth picture control on some sets, variously called a 'sharpen' or 'crispener'. At the 'sharp' end of its range resolution is usually enhanced, though sometimes at the expense of over-exaggerating detail by 'peaking up' the luminance response.

SOUNDING SERIOUS

TV sound has been bloody good – comparable in many ways to FM radio – for many years. It has also been bloody mono, which matters little enough when Peter Sissons and Michael Fish are talking their heads off, but which does scant justice to the Chicago Symphony Orchestra, the soundtrack of *Star Wars*, or even Jive Bunny and the Mastermixers.

The fact that it has taken more than 30 years for stereo sound to percolate through from the music business to television broadcasting is inexcusable, but the reality is that stereo sound with broadcast TV is now (almost) with us (you've been able to rent the videotapes for years). However, the good news is that, by waiting a few years longer for stereo than the Americans, Germans and Japanese, the NICAM 728 system being used for UK broadcasting ought to be very good indeed.

Those of you who want to impress your friends down the pub might be interested to know that NICAM 728 is the acronym for a Near-Instantaneous Companded Audio Multiplex system that uses a 14/10-bit (companded) digital bitstream signal at a rate of 728kilobits per second.

All this companding and multiplexing is brought to bear in order to squeeze a quart-sized (near-CD standard) digital stereo signal down into the pint pot of 728kb/s, which is roughly half the data rate used for CD. There is some theoretical compromise involved of course, but subjective results are reckoned to be pretty comparable.

With Dolby Stereo surround sound videotapes of major movies already widely available (for the discerning few with hi-fi VCRs), and stereo broadcasting already established in Germany, CTVs with stereo chassis (amplifier and speakers) have been around for several years now. Such models also usually have some sort of stereo audio inputs and outputs to assist

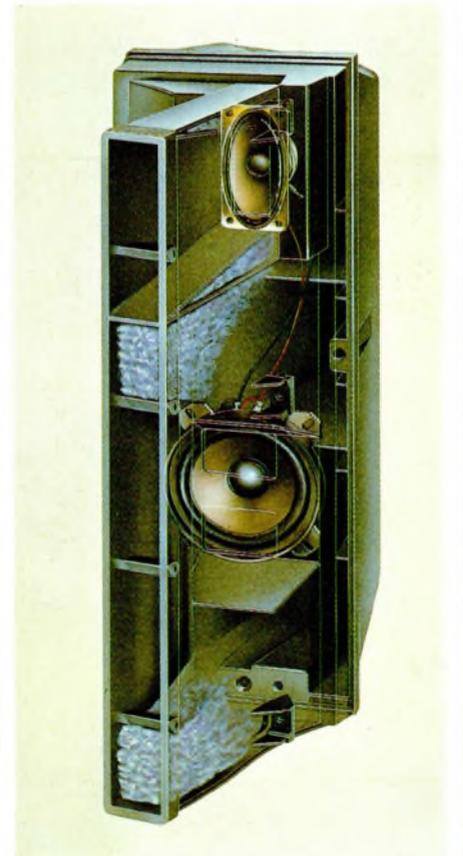
with hi-fi system integration, though this can be a perverse and tricky area. And with NICAM broadcasts starting up this autumn on ITV in London and Yorkshire, and from autumn 1990 on BBC, the focus on stereo sets will steadily increase.

Whether manufacturers choose to integrate the NICAM decoding chip set in an existing stereo CTV or design and launch new models around the feature is their choice. An arguably more valid option, pioneered especially by JVC, is to fit NICAM circuitry into a Hi-fi VCR (see *Choice* June '89). This may be slightly less convenient for receiving NICAM broadcasts day to day, but does facilitate making stereo recordings for the future, and aids integration with a hi-fi system, while also allowing you to go on using an existing mono sound CTV in a monitor role.

Either approach falls down when you want to record one stereo programme while watching another stereo programme, so eventually NICAM will probably be incorporated into both CTVs and VCRs. However, for the time being the consumer has the option of where to have his or her NICAM chips. The decision on which to buy first will probably be made according to which item is the most clapped out, or which would be most useful if transplanted to another room in the house or another member of the family.

Historically, and with very good reason, hi-fi enthusiasts have regarded the sound quality of the television set with the sort of suspicion and contempt normally reserved for portable radios. In my own past experi-

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ence (disregarding the new test group collected for this issue), even the top B&Os fall somewhat short of budget hi-fi standards, though a rare, decade old Swedish-built Philips *K12* is a solitary exception that proves the rule.

Having been rude about the standards of sound quality in the CTV market, it's only fair to point out that some manufacturers are making a serious effort to support NICAM by improving audio performance. Panasonic has come up with an interesting in-built system, Sony has some cute detachables, and Ferguson has some attractive optional add-ons.

CTVs today fall into two groups: 'monitor' style models which are built tightly around their screens, with speakers tucked away on the sides of the back; and more traditional but 'stereoised' sets which flank the faceplate with a pair of slimline speakers. Hiding the speakers away monitor style does minimise the visual intrusiveness of the set, though it does little for the projection of high frequency sounds in particular, except perhaps where the set can be placed symmetrically across a room corner with good reflective walls on both sides (a situation I am unfortunately entirely unable to replicate).

The monitor might therefore be the best solution for those with appropriate corners or who plan to use separate external loudspeakers anyway. But the conventional stereo set may be better suited to free-standing or middle-of-wall sites, and for those unwilling to explore the delights (and frustrations) of A/V integration.

FEATURE ENRICHMENT

Back in '86, a quarter of the large screen sets sold still had manual control, and only 40 per cent had text. 1989 looks like ending up with non-remote sets taking less than six per cent, while nearly two-thirds will be teletext models. These market dynamics are as much supply as demand led, and have been helped by steady erosion in the price premium for these extra features. Text now costs about £50, against £150 or so in 1981, for example. The average price paid for a large screen set was £377 in 1988, against £366 in '87, but like-for-like comparisons show prices actually dropped eight per cent.

The NICAM digital stereo sets which make up the bulk of those reviewed this month represent the next step forward in 'adding value'. The NICAM circuitry itself probably adds about £50-£100 to the purchase price at present, which seems a pretty good deal, though the set itself needs to have a stereo amplifier and loudspeaker system of some sort – and arguably one which is capable of doing justice to the potential sound quality on offer.

Aside from presenting moving pictures in glorious PAL colour, alongside digital stereophonic sound, modern CTVs are increasingly able to perform a variety of

other tricks, largely as the result of increasing digitisation of the control circuitry.

Indeed, if you get one of today's sets delivered without either remote handset or instruction manual (or both) – as happened with my JVC, Panasonic, Sanyo and Sony review models – it's all down to guesswork as to how the control and tuning-in hieroglyphics operate. There's none of the obvious, intuitive knurled knobs of yesteryear. Lose the remote handsets, and you can barely turn the things on!

Remote control would have developed anyway (some might say over-developed, given the complexity of the latest programmable handsets), though teletext has certainly provided a major spur. I must admit I'm not a great fan of this digital data medium, finding accessing times infuriatingly slow, each page of data frustratingly limited, and even the inability to access text out of broadcast hours somewhat irritating. Still, I suppose one shouldn't look even an electronic gift horse (after the initial price premium) in the mouth. And both setmakers and broadcasters are trying to make the system a little more user-friendly.

Computer-controlled teletext and Fasttext are two variations on the same theme which automatically store several pages in digital RAMs, facilitating rapid access to several related pages. They differ only in that the former was developed by setmakers and usually stores only the page number sequence, while the latter is now a universal standard based on using four-colour-coded handset buttons to access page links that are 'intelligently' determined by the broadcasters. The teletext enthusiasts out there will be pleased to hear that computer-controlled Fasttext is at last with us; the rest of us will remain baffled by the bewildering array of buttons.

If text is gradually becoming easier to use, so too are remote handsets themselves, thanks to the development of on-screen graphics. There's a certain irony in going back to analogue (line-and pointer) displays to show how the digital controls are set, but there's no doubting the value of this feature in the day-to-day setting of basic variables like volume and brightness. Indeed, the multiplication of TV sources and growing complexity of A/V interconnection all increases the need to provide information on the status of the set and the system, for which on-screen graphics is the most logical solution.

With dozens of different functions available on all the handsets, it's maybe inadvisable to pick on just a couple. But the ability to set up all the picture parameters and store into memory what Philips terms a 'personal preference' is very useful, especially when separate memories are available and automatically selected for TV and A/V inputs, as on the JVC and Hitachi sets. If that's one of the more worthwhile features, try listening to the 'stereo wide'

function that only JVC seems to have had the good taste to omit. A push of a little button does odd things to the stereo phase relationships and destroys all focus, drains the sound of bass energy and makes sure that the images come from all round the room except the set itself; truly bizarre.

The various microprocessors used for text and control functions are based on permanent memory (ROM) stores of command protocols, linked to small quantities of volatile RAM for text enhancement, learning remote and such features. ROM-based microprocessors also set up and monitor the operating conditions for the set itself, helping to ensure that performance is maintained despite the insidious influence of component drift.

Now that large quantities of RAM memory are available at relatively cheap prices, all sorts of new possibilities are starting to become feasible in the realm of picture manipulation, in many cases via VCRs as well as CTVs. An obvious example is the PIP (picture-in-picture) feature fitted to the Sanyo set tested in this issue, which allows a small, low resolution second picture from VCR tuner or tape, or a surveillance camera, to be inserted into the corner of the screen being watched. A camera link might appeal to the paranoid, for baby minding say, or to monitor the front door, while no VCR user will doubt the useful-

Lose the remote control handsets and you can barely turn today's TVs on – Philips 'hieroglyphics 'n' all' digital RC5910.



ness of this little window in finding both the right place on a videotape and the exact time a programme starts, without interrupting normal viewing.

PIP-type image manipulation techniques may also be adapted to provide a variety of other tricks and gizmos for those so inclined – freeze frame, digital 'enhancements' and so on. But a further development, shown in public more than two years ago but still to reach production, particularly appeals to the hi-fi purist in me, since it operates directly on the picture quality itself, improving stability and reducing watching fatigue.

Flicker-free operation is the prize for doubling up the tube scanning speed to 100Hz, but the price is heavy as fields have to be stored and repeated at high speed from a large, high resolution memory to accomplish the trick. The ability to maintain and even improve detail while significantly reducing glare left me subjectively very impressed by this development, especially for open air live broadcasts (ie sport).

Theoretically, flicker free should significantly enhance the available white/black dynamic range by removing the limitation created by the 'glare' of interlace flicker, though there are probably engineering constraints in terms of tube life and X-ray side effects that need to be sorted out on the tube-drive front. Plans for commercial-

isation are still in the pending tray, and some sources suggest we may have to wait for the advent of high definition/wide screen (HDTV, or maybe IDTV and EDTV) before this feature gets up and running. Don't hold your breath.

INTERCONNECTIONS

If you thought things might have got simpler by the time you'd struggled this far, be prepared for a shock. In fact I've been quite deliberately putting off writing this bit for as long as possible, just because of the nightmares involved. Since the age of simplicity, when all one needed was to plug a (75ohm coaxial) aerial down lead into the back, the interconnection of TV and video equipment – not to mention its integration with hi-fi systems – is threatening to take on the characteristics of the tower of Babel. I'm inescapably reminded of the near-chaotic situation in hi-fi some twenty years ago.

The solitary aerial (RF) input is fine as long as reproducing terrestrial broadcasts is the limit of one's ambitions. But this 'entry port' to the picture display and sound circuitry is designed for the convenience of the broadcasters and the package which they deliver. The whole lot – a picture, colour and sound – needs to be combined into a single 'composite' signal for broadcast purposes.

Originally designed around the require-

ments of the broadcasters, CTV's massive commercial success in reaching 98 per cent of households created a de facto standard that has subsequently been heavily exploited by alternative sources. VCRs, camcorders and home computers would never have got off the ground without the substantial 'installed base' of CTVs. Whatever its internal workings, each of these alternatives started life with an output stage – known as an RF modulator – which consciously mimics the broadcast signal and can therefore be plugged into an unmodified domestic telly.

That's all very well as far as it goes, but it brings all video signals down to performance limits imposed by the PAL broadcast system. At least theoretically, NICAM has finally brought a digital stereo sound capability to the RF access point, but only of course for the small number of NICAM equipped sets. Wired (as opposed to broadcast) sources such as stereo and Hi-fi VCRs were long ago forced to make alternative arrangements for stereophony.

Although it's quite convenient to link VCR to CTV via the aerial lead, it's also a bit daft to keep modulating and demodulating the composite-video-with-audio signal, when these could be passed directly to somewhere in the middle of the CTV – after its tuner, using the telly in a monitoring (A/V) role. This option became more important when stereo VCRs and prere-

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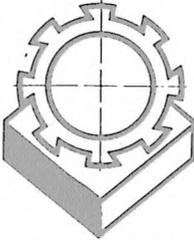
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Demonstration by Appointment

corded tapes came on the scene: now the VCR needed to provide left and right channel audio outputs to either hi-fi or stereo TV, alongside the single composite video signal. Three phono sockets are one favoured solution, another is to have the composite video signal on a BNC connector (sometimes referred to as the CVBS output, which stands for Chroma, Video, Blanking, Sync), though the SCART may be a more convenient alternative.

Composite video is fine for standard VHS domestic video, which falls well short of broadcast standards anyway, but computer graphics are another matter. Indeed, ultra high resolution monitors for CAD (computer aided design) workstations have represented the state of the CPT (colour picture tube) manufacturer's art for the last few years. Since the CPT is based around using three electron guns for Red, Green and Blue (RGB) signals respectively, the highest resolution computer graphics systems generate these three separate video 'component' signals, bypassing the tuner and demodulator sections of the TV set and driving the tube directly.

It was with computers particularly in mind that European manufacturers got together and came up with the 'future-proof' 21-pin connector, variously called a SCART, Peritel or other obscure and less obscure names, some of which the censor has removed. This has been around for long enough to become a well established alternative standard, and is handy for connecting VCRs as well as computers. It will be the only way of getting all the picture quality benefits of future MAC satellite broadcasts, and as far as several of the test NICAM CTVs are concerned, may be the only way of getting the stereo broadcast signal out. Like the AV phono and BNC connectors, using the SCART socket turns the TV set into a monitor.

SCART's strength is to allow a whole variety of standardised access points to different parts of the TV receiver – R, G, B, composite video, audio in/out/left/right/earth, chroma and so on. But there are some snags for all that, and it's not turning out to be quite the universal panacea for all future possibilities which had been intended. Computers may like to talk in R, G and B component video, but (harking back to the days of monochrome compatibility) baseband video (off-tape) and broadcast signals are more conveniently packaged into two rather than three components – one for brightness (Y for luma), the other for colour (C for chroma).

One of the limitations of the PAL/composite broadcast signal is that it gets Y and C a little mixed up. The unwanted colour that appears on a news reader's herringbone pattern jacket, for example, is due to fine resolution Y signals being misread (or additionally read) as C signals, which puts an upper limit on the resolution available from PAL broadcasts, and helps explain why higher definition alter-

natives such as MAC (multiplexed analogue components) are being actively developed.

A VCR used primarily to time-shift television programming will be subject to the same PAL constraints on picture quality. But camcorders are freed from the requirement to broadcast the signal, so there's no need for them to tangle up chroma and luma at all, or be subject to the same resolution constraints. All sorts of advances in solid state imaging mean the domestic camcorder can now comfortably outperform broadcast television resolution, providing the rationale for the new higher resolution video formats such as Super VHS (S-VHS) and High Band 8mm (Hi8).

These rely in part on keeping Y and C apart, so the single phono socket for composite video connection (used by conventional camcorders) must be replaced. Unfortunately the SCART committees didn't take the possibility of Y/C monitor drive into account. There are tricks that may be done to 'bend' the SCART standard to accommodate Y/C – Ferguson has a very clever software-controlled pin system, and some manufacturers have chosen to fit a second SCART especially wired for Y/C operation (connected via inputs only). But the most popular component video drive option looks like being a special 4-pin S-connector which looks a little like a baby DIN socket, alongside a pair of phonos to carry stereo audio.

The socketry on modern CTVs has therefore evolved somewhat sporadically to suit new applications as they come along, so the Babel-like confusion is explicable, if exasperating. VCRs, computers and camcorders have all spawned specific socketry, though the interests of the hi-fi enthusiast are less well served by CTVs than VCRs. Even a comparatively humble VCR will give you a stereo audio output to feed to an amplifier, but with some of our review CTVs only a solitary SCART was able to provide NICAM output, making interfacing with VCR and hi-fi system possible, but something of a headache,

How your TV is connected to a hi-fi system depends on what sockets are available. It can be a tricky business.



and leading to possible future difficulties when additional sources are obtained (camcorder, satellite receiver, etc.).

Future-proofing in today's climate needs as versatile and extensive a range of interconnection options as possible, in my opinion. However, this is still an area where manufacturers are apt to try and make economies. After all, the TV set works perfectly without all the extra confusion as far as 90 plus per cent of customers are concerned, who wouldn't know a SCART if it bit them on the toe.

From a hi-fi perspective, the ideal would be two pairs of audio line outputs, in circuit just before the TV's power amp stage, either side of the TV's remote volume control so the latter's use is optional. But in extremis, the loudspeaker output terminals fitted to most stereo CTVs can feed a hi-fi amplifier directly; even though this represents a substantial sound quality compromise, it may be convenient since it provides the remote volume and stays locked to the output (not tuner) of the TV.

A final word of caution on A/V integration. If you've got a finely tuned £5,000 audiophile hi-fi system, sticking a £500 CTV between the loudspeakers isn't going to do the sound quality of the hi-fi any favours at all. The TV set itself is a resonant plastic box that chucks out all sorts of electromagnetic radiation, all around, not to mention a fair amount of gubbins back down the mains line, none of which does anything to help a genuine high end hi-fi.

If accommodation permits – preferably separate rooms, though opposite ends of a large room might work – the real hi-fi enthusiast should consider different systems for hi-fi and A/V applications. An alternative might be to investigate projection rather than CRT televisions, which opens its own wormcans and is beyond the scope of this feature.

High Definition Television (HDTV) and what the future holds for us is a subject all to itself. We will be reporting further on it in a forthcoming issue – Ed.



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Due to a special deal with Presence Audio, Opus 3's UK distributor, *Hi-Fi Choice* is offering its readers these CDs at a special price of £12.95 plus postage and packing. The two sampler discs *Test Record 1 – Depth of Image* and *Test Record 3 – Dynamics* are especially recommended as excellent introductions.

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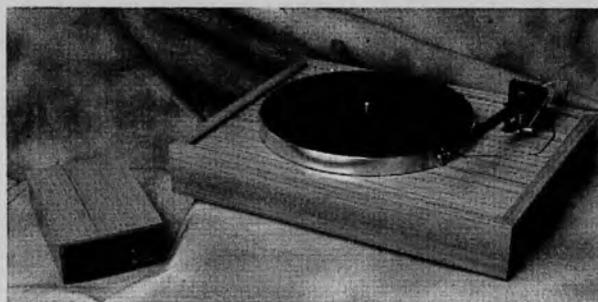
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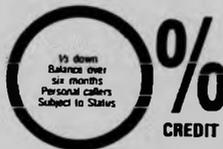
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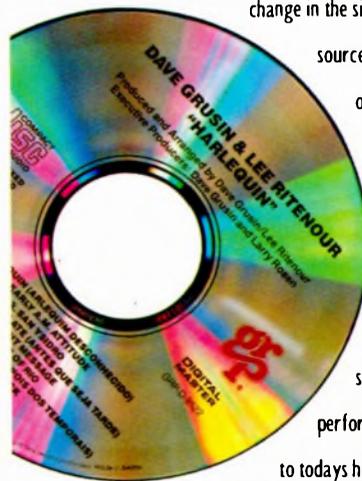
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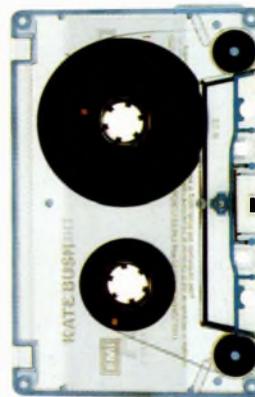
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READERS WRITE CHOICE ANSWERS

ANALOGUE COMEBACK

Upon your return of the Analogue Electronics *FAIV* power amplifier reviewed in the September issue of *Choice* it was found to be faulty. As the review indicated that the bias pots might be at fault we investigated this area first, and they were found to be correctly adjusted. The problem was located in the power supply where a faulty component had caused the supply rails to become unbalanced. One rail was found to be +26V the other -22.3V, this difference upset the bias system and created the rather poor crossover distortion noted.

The design of the *FAIV* is such that this distortion would have become worse the harder the amplifier was driven. Thank you for allowing us to redress the balance a little.

R. S. SLACK,
ANALOGUE ELECTRONICS.

DO IT YOURSELF REVIEWING

If you could be persuaded to test the Linn *Quasar* (mine is two years old and I'm still waiting!) and *Vega* amplifiers, I could be persuaded to renew my subscription! It's a shame that you and *HFN* extensively test so many run of the mill mass produced amplifiers - I can't see the point unless a product has some special feature, or a quick preliminary audition surprises you. So here is a standard review for you to use with boring amplifiers:

The (insert name of amplifier) is lightly constructed (or) built like a battleship (depending on whether the product is cheap or expensive). The quality of workmanship/assembly is excellent.

This amplifier has more connection sockets on the back than a telephone switchboard. The output terminals are 'flimsy' (or) 'massive' (again depending on price).

The lab test results are rather good, straight out of the hi-fi textbook in fact. The sound is fairly good with CD, average with MM cartridges and below average with MCs (if included). Unfortunately, it's also edgy, cold, nasal and fatiguing; which is strange because it looked all right in the lab. We don't understand this too well yet.

However, the (insert name) earns a cautious

recommendation (or) is beautifully crafted but failed to meet our expectations (depending on price).

EDWARD COURTNEY,
WOTTON-UNDER-EDGE.

Thanks a lot Edward, we will be distributing your letter to our reviewers who will be indebted to you for making their lives so much easier. And yes, we intend to investigate the current Linn amps in the near future.

BACK AT THE CROSSROADS

My system comprises: Rega *Planar 3*, Marantz *CD6511SE*, Rotel *RA840BX3* and Monitor Audio *R300MDs* connected with Exposure cable. I now want to upgrade the turntable and amplifier, but seem to be at an audio crossroads. Do I go for a mid-price turntable ie *Axis*, *Mantra* or *Systemdek* and a top grade integrated amp like the *Exposure X*, *MF B200*, Rotel *RA870BX* or *QED A270*? Or should I get the best turntable I can afford and upgrade the amp at a later stage? I have a feeling your answer will be the latter, and have a few in mind; Linn *Sondek*, Roksan *Xerxes*, Townshend *Rock*, Alphason *Sonata* or Pink Triangle *PT 200*.

Bearing in mind my system and the sound I'm trying to achieve - good depth, clarity and detail in a 15ft x 12ft room - and the possibility of a future amp upgrade, which do you think I should audition? If compatible

etc, I must admit that I fancy the *Xerxes*, eventually adding pre/power amps of Exposure or Musical Fidelity calibre.

STUART GIBBONS,
TORQUAY, DEVON.

You're right, we would advise you to go for a top flight turntable as it's the only rational step to take. Which turntable is another matter; the only one on your list that really fits the bill is no longer in production - alas, the Rock is no more. It has been replaced by an improved and considerably dearer version, the Rock Reference.

If you really want to hear what's on your records with the minimum of coloration and compression, rather than the alternative which is to make records sound nice, fast, toe tapping and usually 'musical', then we would suggest you audition the Voyd Valdi. It costs a similar amount to the decks you list and works well with Helius or Rega arms and Goldring cartridges. The Valdi will transcribe what's on the record with relatively little of the euphony created by many expensive gramophones, and with the majority of records this turns out to be a remarkably good thing and one which once experienced is hard to do without. The dealer who demonstrates this turntable should be able to give you some pretty solid pointers for upgrades for the rest of the

system, and for our part we suggest you go for amps that glow.

FINDING THE BALANCE

I read your reviews with considerable interest and enjoyment, and I wondered whether you might have some suggestions on speakers.

I am in the process of upgrading my B&W *DM330s*, and have been trying out the Spondor *SF2/2*, *SPI*, and Musical Fidelity *MC4*. I have been very favourably impressed with all three. I found the *SF2/2* had a very clearly-defined soundstage, with a very transparent midrange and treble; I listened to them with great pleasure, because of the non-aggressive and revealing character, but rejected them because of an inadequate bass response - bass drums and double basses almost disappeared, and cellos lacked solidity. I thought the *SPI* would correct this problem, but although it is slightly better it still doesn't meet my needs for audible defined bass lines that I can follow - the bass can be made audible by using the step control on my Quad *306/34* but it then seems to lack definition. Incidentally, I use a Philips *CD 960* as source, and I haven't got as far as bi-wiring speakers. I also thought that although the soundstage on the *SPI* was bigger, and the treble more extended, the *SF2/2* was a little more accurate in the soundstage and a fraction less bright.

I tried the *MC4* entirely on the basis of the *Hi-Fi Choice* review, and the bass does exactly what I want - I can hear every note, clearly beginning and ending, and in the right place. Unfortunately there is a cost - the slightly recessed midband, and the distinctly aggressive treble. For chamber music and orchestral I am entirely happy with the *MC4*, but I am not happy with its performance on piano - particularly less-than-perfect recordings (eg Gilels), where every clanky note is emphasised; this again I am unable to correct by using the filters on the Quad.

In the past I have tried the Quad *ESL 63*: I was happy with the midband clarity but found the bass unacceptable - inadequate and slow.

I read your review of the Spondor *S100* with great interest, but I am reluctant to go for that



For serious information retrieval only: the Voyd Valdi.

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size of speaker if I can avoid it, and I am not sure if the bass would meet my requirement anyway.

The sound I enjoy most, by a fair margin, comes through my Beyer DT990 headphones – every line is clearly-defined and adequately weighted, from double bass to triangle. Unfortunately, I find them a little uncomfortable after half-an-hour or so.

Any comments or suggestions would be very welcome. Will bi-wiring the MC4 solve the treble problem? Will filling the monopod stands the SPIs are on (sand? cat litter? lead shot?) define the bass?

KEITH BLENKINSOPP,
AMERSHAM, BUCKS.

It's good to see some personal investigation going on out there. You must have a helpful dealer – who is he/she? As regards your problems – first, filling the speaker stands with a mixture of sand and lead shot will undoubtedly help bass definition, and buying heavier two or four column stands will further improve performance. But the aggressiveness you have encountered in the MC4's treble may well be created partly by the CD player – these speakers are somewhat more revealing at high frequencies than the Spondors. One way to get over this would be to use Monster CD interconnects which seem to sweeten the treble; they cost about £40.

Bi-wiring with good quality cables – see the Directory for recommendations – will create allround improvements, most notably better clarity and extended bandwidth. But unless you are presently using very poor cables, bi-wiring won't necessarily make the treble less aggressive.

We suspect that your best option is to get some heavyweight stands that are spiked into the floor and Blu-tacked to the cabinet and use them with the SPI. The result will be improved definition throughout the bandwidth as well as an enhancement of the characteristics you mention.

SERIOUS CD TWEAKS

The fact that Chris Bryant was 'a little perplexed' (July 1989) by the improved sound of the Meridian 207-Pro CD player with the new Philips chip set (7220P/B, TDA 1541A) suggests that the full significance of the new set has not been appreciated fully. I've had a similar experience. I bought the Marantz CD87SSE which you rated as excellent 18

months ago, and was very disappointed until it was heavily tweaked, whereas the new CD583 was, despite a few rough edges, thoroughly musical straight out of the box.

Peter van Willenswaard writing in the May 1989 *Stereophile* explains what Philips has done. Conventionally, at the zero-crossing point where the signal changes from positive to negative, the digital code changes from 000...000 to 111...111; all 16 bits change at the same time, putting the maximum demand for absolute accuracy on the converter just at the most critical point, both musically and technically. In the new system this changeover has been moved to the –63dB level, where it should be masked effectively, by changing the 11th bit. Now at the zero transition of the signal only the last six bits have to change, from 100...00011111 to 100...00100000; that's a lot easier. This is, no doubt, a wild simplification – but I hope it shows the basic principle.

The admirable account in

with a Torx screwdriver to find out whether the company has got to grips with the problem.

Walt Jung in the American magazine *Audio* (June 1987) recommends substituting the NE5535 or AD712 dual op-amps, with a 3.9k resistor from each output to the negative supply in order to force the output stage into Class A operation. I can testify to the way this removes many of the 'nasties' associated with CD sound. Bypassing the 'safety resistors' which strangle the positive and negative supplies to these chips makes the sound more dynamic, and substituting better (in my case polypropylene) output capacitors for the electrolytics, finishes the job. Whoever heard of 'real' as opposed to 'consumer' hi-fi with electrolytic output caps? Although some sound much better than others.

Jung and Childress in the *Audio Amateur* (1988, 1/2) proposed a more drastic modification. Most of their changes – beefed-up power supplies and better quality

me where I can buy the NE530 and LH0002 in this country, so I don't have to order kits from America?

D. F. FOXON,
MARSTON, OXFORD.

Anyone wishing to correspond with Mr. Foxon can send a letter to the Choice office. We will be happy to forward it to him.

TERRIBLE SOUND

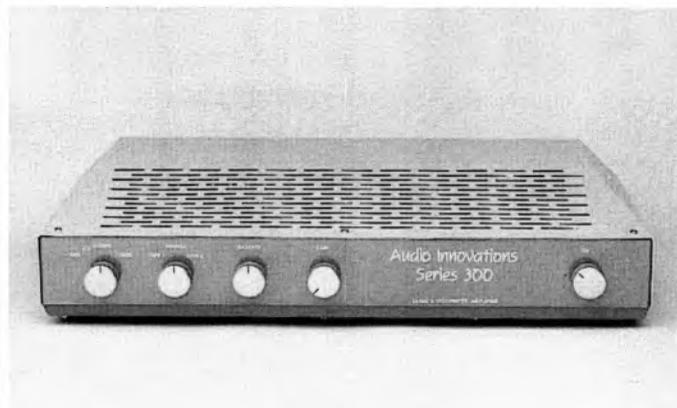
In your August issue you tested a *Cyrus 2* with the Musical Fidelity MC2s. Although you didn't clearly say so, the tenor of the report was that the system and speakers were not as you had expected.

In my search for speakers I auditioned the MC2s with the same amplifier and they sounded really terrible. I had been warned by the shop assistant that they simply didn't match, and he was right: You should have noticed and mentioned it. I now have Rogers LS6a loudspeakers, a Systemdek IIX with an Audio Technica arm and cartridge, Philips 371 CD player and a *Cyrus 1* amp. It's this last component that I want to upgrade. I need an amp which will work well at low volume and produce a detailed sound with good bass. I don't have a specific budget in mind but given the rest of the system, would have thought that £500 is the top line.

PAUL SANTINI,
UDDINGSTON, STRATHCLYDE.

It would seem that your definition of terrible is on a par with AG's definition of mediocre. However, our reviewer may have used more compatible/sympathetic cables, stands and source for that matter. But the bottom line with equipment at this price is that very little of it achieves true high fidelity and some sort of compromise is inevitable. Thus personal taste becomes an arbiter and certain balances suit certain ears better than others, which, while ideally unsatisfactory, seems to be the way the cookie crumbles.

Given your specifications for an amplifier, and with your loudspeakers, we have no hesitation in recommending the Audio Innovations Series 300. This has wider dynamic range and better transparency than virtually any other sub-£500 amplifier, but what it does lack, is power. Ten Class A watts go a long way but they won't keep a headbanger happy. As you sound like the sort of man who appreciates accuracy rather than raw power this shouldn't be a problem. (For your next upgrade – check out the new Audio Innovations tonearm.)



For low level listening you need wide dynamic range, and to get that you need tubes.

Stereophile is more detailed, but still admits to cutting some corners. What is clear is that Philips has made an elegantly simple technical breakthrough (and now improved the manufacturing quality of the chips) but has not publicised the fact – so journalists have noticed the improvement without realising that the new chip set almost inevitably makes a fundamental change in performance.

If only Philips (and other manufacturers) would start using better op-amps than the dual LM833 and NE5532. The 5532 is a pleasant-sounding chip but it's just not fast enough for the role it has to play here. In your review of the Marantz CD85 (May 1989) you report that it uses single chips, but not what they are: please help us – we can't go round to our local dealer

passive components – are now common in more expensive players. But their replacement for the op-amps is something else again. They use a NE530 first stage with feedback to the nulling terminals so that it operates in the transconductance mode, and a LH0002 video buffer for the output. Now CD really becomes comparable with vinyl.

It wouldn't be difficult for the major manufacturers to produce this quality of sound economically if they only tried, at least as far as the electronics are concerned – and it might be even better using discrete transistor stages. Problems of vibration are much more expensive to deal with commercially (as your *Collection* issue shows only too well), but easier for the amateur to experiment with.

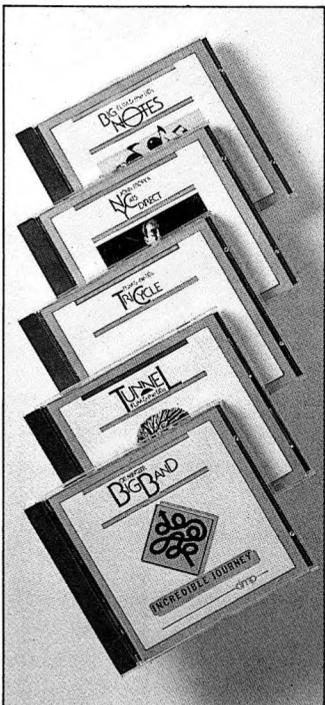
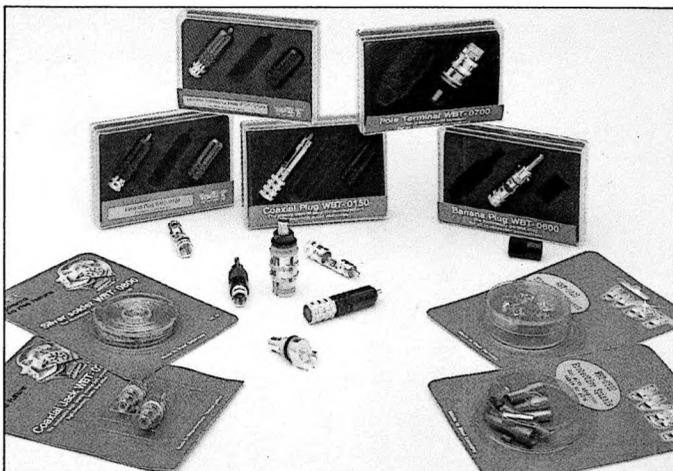
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DENON

D E S I G N I N T E G R I T Y



MARKET RESPONSE

In our exclusive market survey Dan Houston polls specialist dealers about CD players, asking about reliability and current trends in the marketplace.

One of the most exciting developments in compact disc technology is the 'imminent' arrival of CD-R or CD players that can record on to blank compact discs. CD-R has been pioneered by the Japanese chemicals firm Taiyo Yuden (manufacturers of the highly regarded That's Tape compact cassettes) which has teamed up with Sony to make the product. That's importer Harman Audio says players and software should be available in spring 1990. The machines use a low power laser to record a digital bitstream on to the disc. The WORM (write once read many) disc can then be played on any conventional CD player.

Unfortunately, as far as the general consumer is concerned, CD-R will at first only be available to the professional market in a similar way to DAT machines, where they will be useful for limited pressing runs. DAT has been stuck in limbo for two years while the record industry argued that it posed a threat to artists' copyright. With headway made on the DAT situation, players will arrive next year with the ability to make one copy at a time of a digital source, (in an attempt to prevent piracy), and so the situation with CD-R looks more healthy. The parties concerned, the hard and software industries, have promised to resolve the copyright issue 'at an appropriate stage of development'. Philips, for instance, expects to be able to sell CD-R machines to the public by 1991.

The hi-fi industry has enjoyed a booming period with CD, with

sales still rising at the rate of about 30 per cent a year. In fact many dealers believe it has saved what was becoming a flagging business. CD, which offers better sound quality than most budget turntables, has raised public expectation of what reproduced music should be like – one can argue that it has boosted areas outside 'hi-fi' such as in-car entertainment and the professional sound field. Many dealers also say it has helped to promote sales of record players with customers willing to pay more for the superior sound quality available on more expensive decks.

For this survey we spoke to 36 dealers 15 of whom said they sold more turntables than CD players. Seven said they sold equal amounts of each while 24 put CD as number one. Sales of standalone or separate CD players are rising faster than anything else although the rate is beginning to fall.

The Audits of Great Britain Group told us that in the year from July 1988 to July 1989, 571,900 units had been sold – a figure 30 per cent up on the previous year. However, the corresponding value of this market, which is now worth some £114.5m, has risen by 24 per cent, reflecting price cuts in the wake of rising interest rates and the incidence of cheaper standalone players. Nick Simon, of AGB, said the average amount spent on a CD player this year was just £200, compared to £208 last year.

Several dealers noted sales of CD players rising over the last year in spite of rumours that this has been a disastrous summer for sales. We heard comments that people were upgrading old analogue systems and that the first generation of CD players were now being replaced – taking advantage of the technological leaps that have been made in the six years since CD's inception.

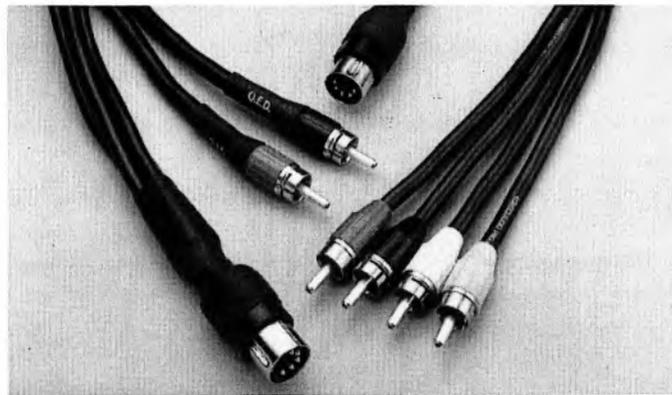
However, this also reflects the

shorter life of CD players compared to the record decks that they have replaced. Chichester Hi-Fi told us: "a player bought in 1984 is considered old, but we still service turntables which are 14 years old". Several dealers commented on the throwaway aspect of cheaper CD players. Bowers and Wilkins told us that with replacement laser costs running at £70 plus labour it was becoming cheaper to buy a new player. "The manufacturers' attitude is that it is often not worth the bother to repair them. We had two three-or-four year old machines where the cost of repair was greater than the original purchase price."

RELIABILITY

There are conflicting reports about the reliability of CD players, and several dealers told us that there was barely any problems at the moment. Certainly our quality control poll, which gives a quick indication of 'out-of-the-box' reliability, is better with only two per cent of players arriving faulty according to dealers. In May we reported a similar finding of four per cent. A couple hadn't seen a faulty player in six months although Chichester Hi-Fi, which sells seven times more turntables than CD players, told us: "they are all pretty unreliable, certainly the most unreliable area of hi-fi at the moment. It's also difficult to repair a CD player since it often takes a long time to find out what has gone wrong."

Dave Benson, of Videosonic Services in Brighton, told us that



QED – one of the more popular interconnects sold with CD players. And below Marantz's phenomenal best seller, the '65SE has just been replaced by the CD-50. Will it succeed the throne?



where he used to repair amplifiers and cassette decks it was now mostly CD players. "The better makes such as Denon and Yamaha tend to be more reliable but on many cheaper models the ICs go out of adjustment and need some tweaking to get the circuitry back to spec. Hi-fi in general is difficult to repair because you spend the first hour taking the item apart. And with CD players the faults are often intermittent – so they're difficult to trace. We can have a player in for two weeks which works fine, only for it to go back to the customer who then complains of the same 'intermittent' fault. That's odd. But it makes it very expensive to repair budget models, and it's sometimes cheaper to throw them away.

"I'm of the old school and I believe things should be repairable – we still mend a lot of old juke boxes here – but with modern machines it's often down to silly bits of plastic breaking off; that's lousy design. For instance with some of the (*older*) Philips machines the drawer won't close and if you push it it breaks. I don't think some of these companies think of the idiot customer who will try to push two buttons at once. It's all very well to give something to an engineer to test but Joe Public is a different animal."

We asked dealers for their most and least reliable brands. It follows that the more a dealer sells of a brand, the more he is likely to discover duff models, but we have found dealers take account of this and often give considered responses based on their records.

The most reliable brands are Denon followed after a gap by Technics, Sony, Arcam and Yamaha. The only significant comments on unreliability went to Philips. A spokesman for Philips claimed there was no reliability problem with the brand at present and pointed out that Philips players, being dominant since the invention of CD, were bound to turn up for repair more often since there were more Philips machines in use. "We also got a very bad reputation with service engineers when we had a problem with faulty VCRs three years ago," he added.

If your machine does break down most of the dealers we spoke to would hope to repair it themselves, or use a local engineer such as Dave Benson. In that case the average turnaround time was just under two weeks. Dealers often rely on service departments for parts and told us the most efficient companies for

THE BEST SELLERS

We asked dealers for their three top selling players in each of three price brackets. The results are calculated on a points system.

Budget Category (up to £200)

Denon <i>DCD620</i>	73
Marantz <i>CD583</i>	48
Philips <i>CD582</i>	31
Technics <i>SLF222</i>	22

Denon, Technics and Marantz were also best sellers in our last survey.

Mid Price £201-£500

Marantz <i>CD6511SE</i>	108
Denon <i>DCD920</i>	61
Denon <i>DCD520</i>	37
Technics <i>SLP 990</i>	19

Marantz's phenomenal lead

speedy delivery are: Arcam, Technics, Yamaha, Cambridge and Mission. Slower service was forthcoming from Philips, Sony, Marantz and Kenwood, they said.

LINKING THROUGH

The audiophile's quest for perfect sound often includes spending vast amounts of time and money on cable to run from the source to the amplifier and then from the amplifier to the loudspeakers. We asked dealers whether they sold specialist interconnect cable when they sold a CD player and heard that in (roughly!) 37 per cent of cases they did. Variants from van den Hul and QED were most popular

confirms the raving success of this leading player, however the firm has just replaced the '65SE with the *CD50* at the same price (one penny change from £300). Will it succeed the throne? Watch this space. The Denon range has also been upgraded recently and is now made in Germany as opposed to Japan. Our model numbers take account of this.

Top Price £501 +

Arcam <i>Delta 70.2</i>	78
Denon <i>DCD1520</i>	46
Meridian <i>CD207</i>	33
Marantz <i>CD94</i>	32
Cambridge <i>CD2</i>	25

Arcam has leapt to the top of the list and several dealers were expecting the new £350 Arcam

with mentions for the Chord Company, Audioquest and Monitor PC as well. Many dealers said they could easily demonstrate the advantages of better interconnect which is available in a variety of forms including solid silver and 'nearly' oxygen free copper types. Carl Woodward, of Pure Sound, said his customers (admittedly fairly well-heeled) 'quite happily' paid for some 99.9999 per cent pure copper interconnect from Gryphon – a Danish company. The price? "They're £99 a pair. It's brilliant stuff," asserted Carl.

ISOLATION

During May's survey on CD

Alpha CD player to be a best seller in the future. Otherwise the picture is much the same as in previous surveys.

The aim of this survey is to give readers a distillation of many dealers' views. We don't pretend the picture is accurate overall since we approach specialists who are to hi-fi what a tailor is to clothing. The average number of brands stocked by these dealers is just seven – no bad thing since the less a dealer stocks (to a point) the more he will know about the equipment. The survey's random approach means that only the common brands are featured, even though many dealers stock one or two esoteric ranges as well. The survey is a poll and should be seen as such.

players many dealers were touting proper isolation (tables, shelves, Sorbothane feet etc) as essential to the sonic well-being of CD sound. However, on asking whether they sold isolation equipment with a CD player many admitted that it was rare – we calculated a mean of their doing so only ten per cent of the time. Where dealers were able to sell isolation platforms with a CD player the popular types were Mission *Isoplats* and Audioquest Sorbothane feet. Bowers and Wilkins told us that isolation was "down to the structure of your house. I put a paving slab on a customer's shelf which worked wonders; all you need is a rigid surface."

Several dealers also vouch improvements in sound quality from damping rings used on the disc itself. Several types of 'ring' are available – many are stuck on to the label side and supposedly reduce reverberations caused by the disc as it spins which equals an easier job for the laser. Pure Sound recommended the £18 Audio Technica *CD Stabiliser* which is a non-stick-on version so you only need to buy one.



The Arcam 70.2 leaps to the top of the over-£500 best seller category.

PARTICIPATING DEALERS

Our thanks to the following dealers for taking part in this survey:

Analog Audio, North Finchley, London.
 AT Labs, Enfield, Middlesex.
 Andrew Thomson, Kircaldy, Fife.
 Audio South, Farnham, Surrey.
 Bartletts Hi-Fi, London N7.
 Basically Sound, Bracon Ash, Norfolk.
 Beaver Hi-Fi, Liverpool.
 Billy Vee Sound Systems, Lewisham, London.
 Bowers and Wilkins, Worthing, W. Sussex.
 Cambridge Hi-Fi, Cambridge.
 Chew and Osborne, Saffron Walden,

Essex.
 Chichester Hi-Fi, Chichester, W. Sussex.
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 Covent Garden Records, London WC2.
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 Gilson Audio, Middlesbrough, Cleveland.
 Hampshire Audio, Chandlers Ford, Hampshire.
 Hi-Fi Corner, Rose Street, Edinburgh.
 Hi-Fi Corner, Glasgow and Falkirk.
 Hi-Fi Experience, Tottenham Court Road, London.
 Hi-Fi Experience, Glasgow.
 Holborn Hi-Fi, Aberdeen, Angus.

Horns Ltd, Oxford.
 Island Compact Discs, Ramsey, Isle of Man.
 KJ Westone, London W1.
 Grahams Hi-Fi, London N1.
 Lyon Audio, Stanway, Colchester, Essex.
 Paul Green Hi-Fi, Bath, Avon.
 Now That's Hi-Fi, Portsmouth.
 Pure Sound Ltd, Birkenhead, Merseyside.
 Stereo Stereo, Glasgow.
 The Audio File, Bishops Stortford, Herts.
 The Cornflake Shop, Windmill Street, London W1.
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DESIGN INTEGRITY



CHOOSING AND USING . . . CD PLAYERS

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

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

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

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

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

THE DISCS

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

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

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

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

THE PLAYERS

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

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

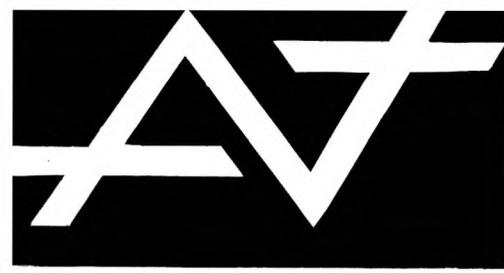
than before. One can of course compensate by cranking up the volume, but if an amplifier is already being used close to its limits, the CD peaks could cause premature 'clipping', for which the only solution is a bigger amplifier.

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

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



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RECOMMENDED



Like most of the competition, this mid-price Japanese built player incorporates a wide range of features – so many that one wonders who is responsible for demanding all this gadgetry. The high product awareness shown by Japanese hi-fi consumers on the important home market may have much to do with it, though inter-brand rivalry for its own sake is probably the main spur.

The XC005 has standard enough presentation. A front panel headphone socket has its own manual level control. The full feature remote control handset has keys for an (optional) power volume control that covers a fairly limited range of 40dB, the current setting shown on the player's fluorescent display. There are two digital outputs (wired and optical) alongside the two pairs of fixed (at a nominal 2V) and variable audio outputs.

Amongst many other features are 'shuffle' play and many cassette-related editing facilities, including 'fade out' and auto space editing. Twenty keys are available for direct track entry.

LAB REPORT

The unshrouded mains feeds a fairly small transformer, and the secondaries are taken straight to the main board for rectification and smoothing by an adequate array of supply capacitors, followed by a mixture of discrete and integrated circuit regulators. Most of the control and digital circuitry uses Sony chips.

The audio circuitry starts with separate Burr Brown PCM58P digital-to-analogue converters for each channel, run from an 8x oversampling digital filter. Nichicon Muse capacitors are used, with several in-line operational amplifiers and transistor muting.

The front panel display board connections are made by ribbon cable. The plastic loading drawer sits on a rigidly mounted pressed steel plinth which also supports a decoupled worm driven laser. The disc clamp is fixed and the transport moves up to meet it. There is no damping material on any of the internal panels, though a strengthening bar runs

front-to-back to divide off the section which accommodates the transport.

This player inverts phase which may be a negative point for audiophiles. Slight clipping was observed on the white noise overload test and the high frequency intermodulation results reveal a higher level of distortion than expected. However, the harmonic distortion results at high levels are impressive. While stereo balance is perfect, stereo separation must be judged poor in comparison with its peers, albeit good enough in reality.

There's no problem with the frequency responses. –70dB distortion is good on the left channel but increases by 10dB on the right, due to the low level (non) linearity of the right channel, which shows some positive errors on the fade to noise test; these anomalies can be clearly seen on the graph.

SOUND QUALITY

Close to if just short of an 'average' rating for sonic merit, the XC005 delivers a decent level of depth and ambience, an open 'airy' sound, and a musically neutral rendition of orchestral string tone. The fine treble quality shows good purity and detail resolution.

Stereo soundstages have good scale, focus and decent perspectives. Transients and percussive sounds are handled well enough, but this promising player is seriously let down in the bass. Here the sound quality is barely satisfactory, being quite out of balance with the mid and treble, and obviously soft and slow. It sounds weak, lacks tunefulness and is somehow out of time with the rhythm and beat. This is not serious on classical program, when one can sit back and enjoy the good qualities, but on rock material the slow bass is the drawback which pulls the final rating down to fractionally below average.

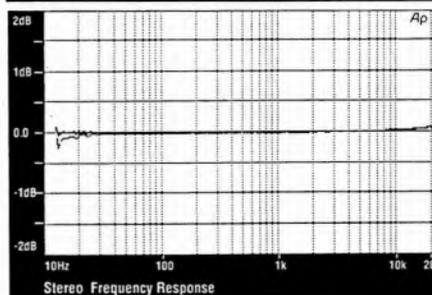
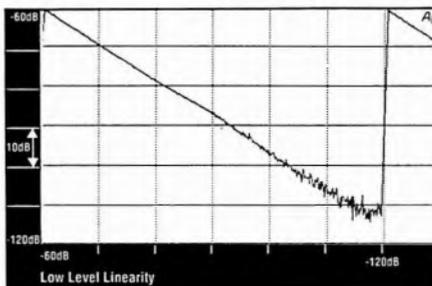
CONCLUSIONS

Comprehensively equipped, this good quality player showed good initial promise, but ended up delivering an average test performance in both lab and listening room. The absolute phase inversion is surprising,

though probably affected the results very little. Although unlikely to be a first choice for audiophiles, the feature oriented buyer and cassette enthusiast might well be seduced; and when all is weighed up the XC005 does deserve Recommendation.

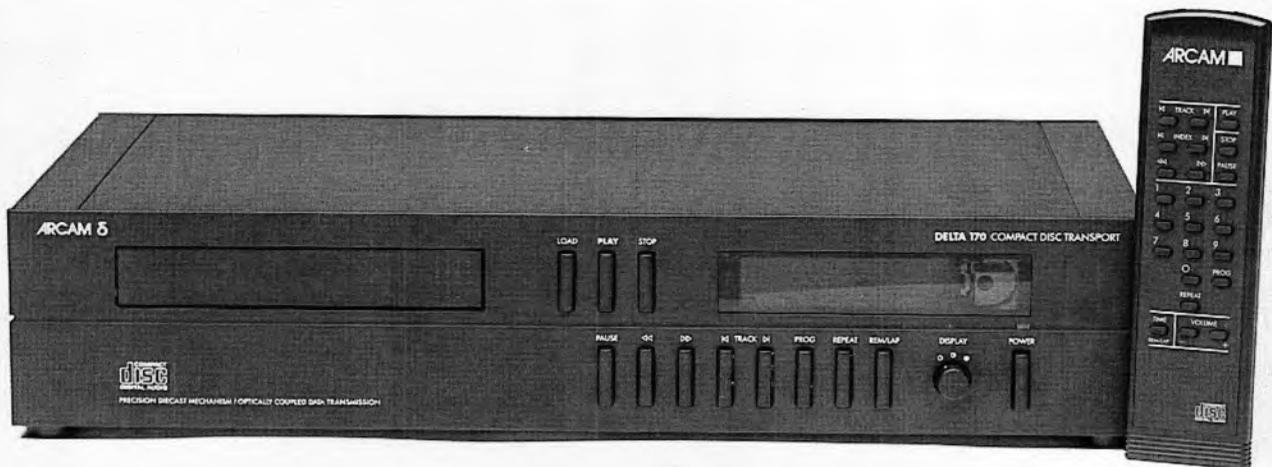
TEST RESULTS

Test resolution (L/R av)		15.4 bits	
Output level, source impedance		2.19V, 0.8dB, 550ohms	
Effective dynamic range		101dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–94dB	–94dB	–89dB
	(0.002%)	(0.002%)	(0.004%)
Ref –70dB			–40/30dB
Stereo separation	91dB	89dB	67dB
Stereo balance L/R	0.01dB	0.01dB	0.01dB
Frequency response (20Hz to 20kHz)			±0.015dB
High frequency intermodulation			–61dB (0.089%)
Electrical noise (CCIR ARM, 1kHz)			–97dB
Mechanical noise			very low
Ultrasonic noise			–108dB
Error correction			1.25mm gap
Shock/vibration resistance			very good
De-emphasis			–0.03dB at 5kHz
Track finding speed (15, YEDS 2)			4 secs
White noise overload test			slight clip
Size (w x d x h)			43 x 35 x 11.5cms
Typical price inc VAT			£280



ARCAM DELTA 170 (CD TRANSPORT)

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



Arcam's CD line-up is now increased by the addition to this £600 CD transport only unit, which is designed to deliver high quality digital audio code to a suitable decoder such as Arcam's own *Black Box* (see adjacent review) or other outboard unit, or alternatively the digital input stage of a 'digital' pre-amplifier, integrated amplifier or even that rarity, the 'digital' loudspeaker.

The idea behind a two-box CD player (ie one with a separate transport) is to separate those internal workings whose mutual interference might mar the ultimate sound quality. This *Delta* transport therefore has no headphone socket or audio outputs, and all the engineering effort has gone into maximising the integrity of the data at the two digital outputs – one optical and one coaxial.

Solidly built using an all metal case, refinements include three degrees of display illumination (normal, dim and off), the latter removing its power to reduce spurious electrical noise within the player, and hence delivering a small improvement in fidelity.

The front panel controls are basic, but a remote handset provides the conventional ten-key pad for quick track number entry and to aid remote programming. The display is helpfully larger than usual, and so easy to read at a distance; the 'dim' setting is comfortable for late night listening. The machine is fitted with high absorption sorbothane feet to aid vibration isolation.

LAB REPORT

The internal construction of this transport unit is much like that of the standard Arcam player. The transformers are located on the right hand side, which is different from other CD players. If stacked with a conventional Japanese amplifier these transformers are very likely to create hum in the vinyl disc stage of the amplifier. The 'transformer on the right' approach now applies to only a few products, mostly of British origins.

The digital control and data acquisition board is identical to that used in the *Delta 70.2*. A ribbon cable transfers the data from the digital filter to the main output board. An

optical isolation interface consisting of Hewlett Packard opto couplers precedes some more digital signal buffering using 74 series logic chips, whence the signal is transformer coupled to the phono coaxial digital output and the standard *TORX* optical link. All the chips on the digital board are socket mounted.

The transport itself is the best that Philips has to offer, the cast alloy laser transport chassis decoupled by four springs. The clamp arm has some extra damping applied.

SOUND QUALITY

It might seem a bit silly to review the sound quality of a digital disc transport mechanism but it can be done. There *are* audible differences between the digitally coded audio bit-streams sent by different players and other digital sources to decoders, such as the *Black Box*, *Digilog* or decoder-equipped amplifiers.

Moreover, subtle differences are not only found between the various sources but also depend on whether optical fibre or wired connection is made. Even more subtle differences can be demonstrated using different grades of connection: for example, given a range of optical fibres (acrylic, multifibre glass and quartz); differences exist which may be compounded by the precision of the fit of the mating components. The type of cable used for a wired connection also has an effect, just as cables can affect sound quality in the analogue audio domain, between, for example, a CD player and an amplifier.

The obvious use for the Arcam transport is to complement the *Black Box 2* and it does this very well, combining to create a first rate two-box player. Checking against other transports and decoders indicated that this Arcam transport is a front line performer, rated above the Marantz *CD85* (a known reference source) used in this mode. Indeed, it is probably not far behind the first rate output provided by the rather more costly Marantz *CD12LE*.

I prefer the Arcam sound to that of many Japanese players. Whereas a Sony *533* or Kenwood tend to sound more precise in the

upper frequencies, with perhaps marginally better definition, they also have harder and less musical tonal qualities, plus a distinct loss in rhythm in the bass regions. I would love to discover what technical factors might be responsible for such differences!

Optical and wired connections were both tried and the story mirrored that above – optical connection gives purer treble but the wired electrical link has a marginally firmer and more dynamic bass, plus a better sense of pace. You can take your pick here.

A final comparison was made using a cheap digital signal source, namely a Philips *782*. This performed remarkably well in context, not leaving much room for the Arcam transport to effect an improvement.

CONCLUSIONS

While the sound quality differences between this customised transport and the digital output of a low cost Philips CD player are small, they are nonetheless significant in the pursuit of CD excellence in combination with the Arcam *Black Box 2*. The value for money here is not in the same class as the *Black Box 2* itself, but the *Delta 170* transport certainly deserves Recommendation.

TEST RESULTS

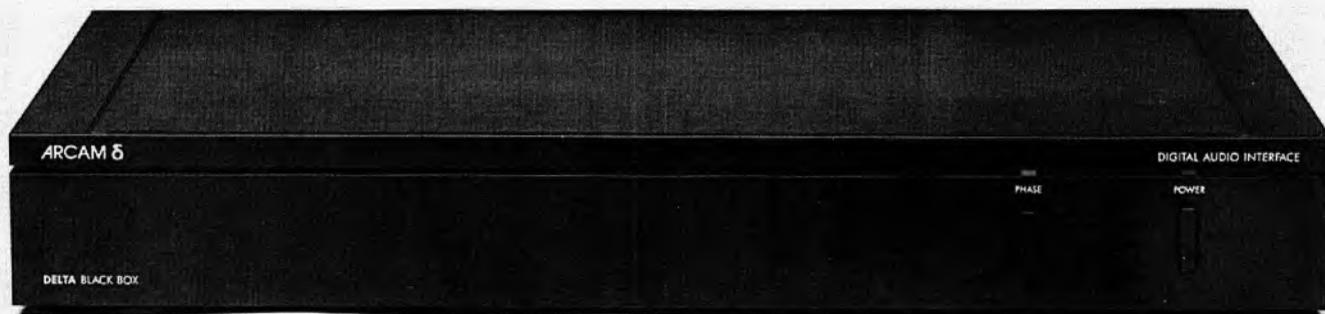
TESTED WITH ARCAM BLACK BOX 2

Test resolution (L/R av)		15.8 bits	
Output level, source impedance		2.53V, 2dB, 28ohms	
Effective dynamic range		107dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-72dB (0.025%)	-75dB (0.018%)	-89dB (0.004%)
Ref -70dB		-39dB	1.12%
Stereo separation	97dB	95dB	96dB
Stereo balance L/R	0.08dB	0.07dB	0.05dB
Frequency response (20Hz to 20kHz)			±0.03dB
High frequency intermodulation			-75dB (0.018%)
Electrical noise (CCIR ARM, 1kHz)			-105dB
Mechanical noise			low
Ultrasonic noise			-111dB
Error correction			4mm gap
Shock/vibration resistance			very good
De-emphasis			-0.08dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)	BB: 43 x 27.5 x 6.3cm;	170: 43 x 27.5 x 9.1cm	
Typical price inc VAT			BB: £299; 170: £599

ARCAM BLACK BOX MK II

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

RECOMMENDED



To justify the new *Mk II* status Arcam has developed some minor design points, and also added an optical input facility to this 'add-on' decoder for CD players. Digital data handling has been improved but the rear panel data signal inversion switch remains and may need to be used with certain (non-Philips) transports. The unit itself is compatible with a wide range of CD players, though ultimately Philips-based designs were preferred, including Arcam's own *Delta 170* transport-only deck.

Such a 'slave' unit as this needs little in the way of features as such: the facilities here include two sets of outputs – one at full level (2V) and the other resistively attenuated to 0.8V and therefore more suitable for higher gain line input stages. The full level output was marginally preferred subjectively. The spartan fascia is finished in typical matt black Arcam livery and has a power switch plus a button for absolute phase inversion in the audio domain. This feature can sometimes provide a small subjective improvement with a few CDs in the more exotic audio systems, but given the good results (see later), the revised *Black Box* could well turn up in some very high class arrangements!

Purchased alongside the *Delta* transport, the £299 *Black Box* forms a matched £900 two-box player. As an add on decoder it will upgrade virtually any other player fitted with a digital output, and may also be added to existing CD players built by Arcam itself.

LAB REPORT

Not surprisingly, the circuitry of *Black Box* digital processor shares much in common with the complete *Delta 70.2* CD player stablemate in many ways. It uses two transformers, one for the digital circuitry and one for the analogue. Chip regulators are used for the digital supplies with one specially allocated to the digital filter. The current to voltage converter has the same Arcam discrete transistor operational amplifier, and film capacitors are used in the analogue filter.

The output is DC coupled and an *LF411* is

used as the DC servo amp. The output amplifier is made using discrete transistors in place of the *NE5534* found in the *70*. The output muting uses a relay but the de-emphasis is transistor switched. The A grade (not S1) DAC is located in an area which is joined only by a narrow bridge at either end, and some connections are made to this area by wire links.

A separate board houses the digital input circuitry, which includes the facility for both optical and coaxial connections. Buffer circuitry is employed to interface this input with Arcam's own digital data decoder chip.

The output level measures 2dB above the 2V standard, from a low output impedance of 28ohms. Full level total harmonic distortion is a little higher than expected, but the in-band spurious of a single 20kHz full level tone are well suppressed. Stereo separation is virtually constant across the audio bandwidth, and channel balance is good. The frequency response plot shows some mild high frequency shaping, and the low level linearity is as expected from the latest Philips chip set – that is, slightly awry below –80dB.

SOUND QUALITY

The listening tests indubitably confirm the effectiveness of the '*Mk II*' revisions to the *Black Box* digital decoder unit. Immediately impressive, it stands out from the crowd, delivering a performance in line with top line twin-box players at luxury prices.

Building on the best elements of established Philips technology, the *Black Box* delivers a positive, well defined sound in a confident and authoritative manner. The bass is very good, showing expression and articulation, extension and slam. Moreover, used with good transports such as the Arcam *170*, pace and rhythm are very well portrayed, in an involving and satisfying manner. Stereo focus is fine and real stereo depth is presented with layered images imbued with clean instrumental separation and fine detail.

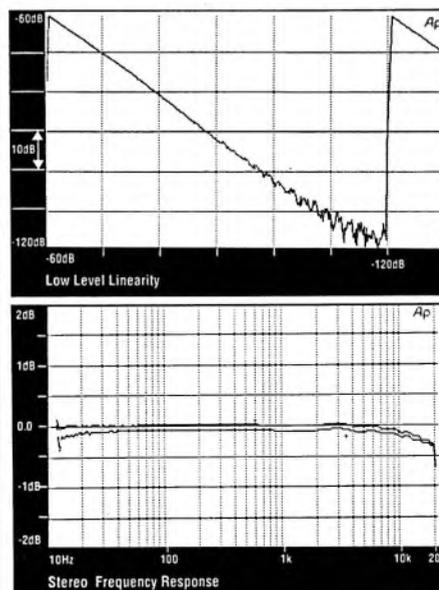
Nitpicking a little, the treble is a touch 'splashy' and violin tone is slightly sharp, but

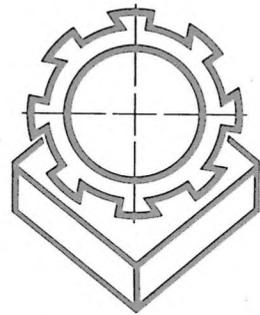
this does not detract from the overall performance, or from the good pace and dynamics. Our sonic rating is 'very good' for this consistently impressive performer; furthermore, a very worthwhile proportion of its potential may be realised when used with almost any digital output-equipped Philips or Philips-based CD player.

CONCLUSIONS

It is impossible to ignore the substantially improved sound quality achieved by this decoder, which is now placed in the top category. Like the revised CD player the *Black Box II* also measures better, and if such a category existed, this would be a 'Best Buy' amongst digital decoders. For a modest enough cost it will transform inexpensive CD players fitted with digital outputs (particularly those made by Philips) and may be strongly Recommended, especially as a partner for Arcam's *Delta 170* CD transport.

For test results see *Delta 170* review.

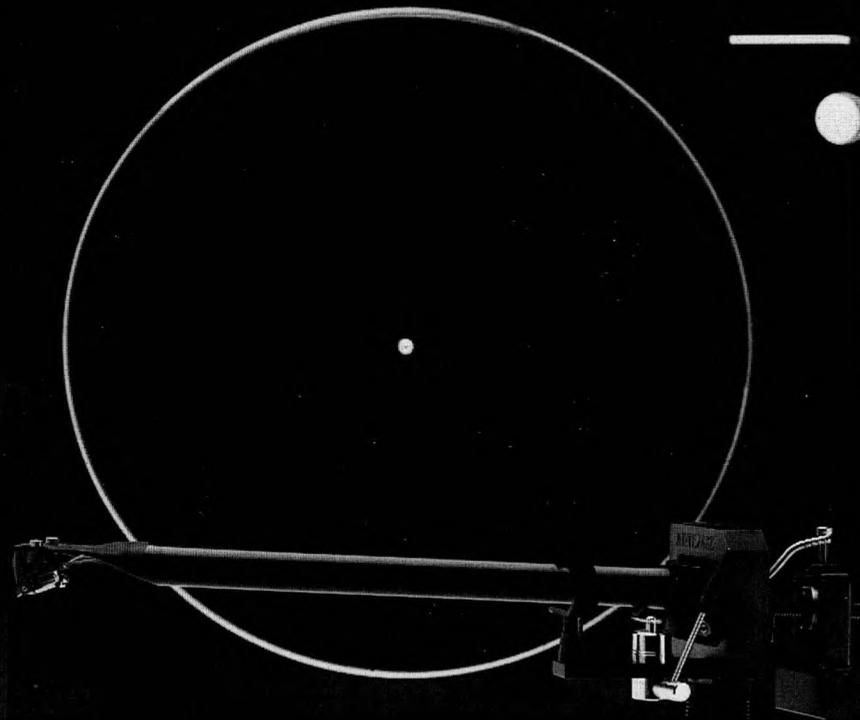




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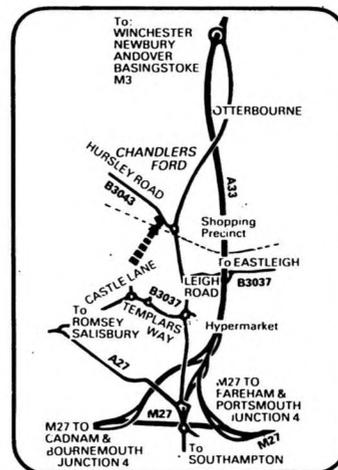
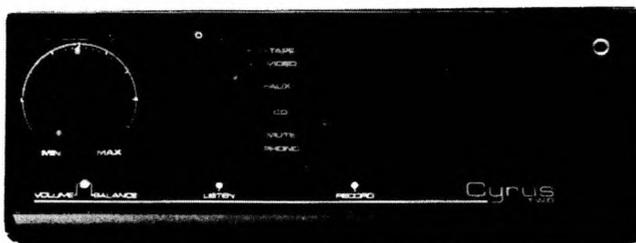
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'No, no, no', said Mad Mike our chief boffin, 'it's you who's got it wrong, not us'. (We hoped he wouldn't get violent). 'You see we've invented two brand new CD players...a mid-price model to join the Alpha range, and the transport only Delta 170.

'The Alpha incorporates a whole range of features normally associated only with much more expensive machines (such as twin power transformers to minimise sound-degrading internal interference) and a robust aluminium chassis. There's 20 track programming and an optional remote control. We reckon its sound quality is unbeatable in its price range; just like our universally commended Alpha amp.

'The Delta 170 is Britain's first CD transport. Whereas a normal CD player reads the digital data from the disc then converts it into an analogue signal, the Delta 170 simply does the first part...and does it with breathtaking accuracy. You need a separate digital to analogue converter (such as our award-reaping Black Box) to turn the transport's output (coaxial or optical!) into an amplifier-ready signal. To put it another way, the Delta 170 is dedicated purely to providing a digital signal of the highest possible integrity. It's a machine only for the most demanding audiophile.

'With our two existing units, the Delta 70.2 and the Black Box, there's now a choice of six configurations: Alpha CD alone, Alpha CD plus Black Box, Delta alone, Delta plus Black Box, 170 transport plus Black Box, and Black Box plus any other player with digital output.

'In other words, Arcam now offers a range of British CD players compatible with every audiophile's budget. So you see, two plus two equals six. Easy.'

Thank goodness for that, we sighed. One lot of men in white coats around our design department is quite enough, thank you.

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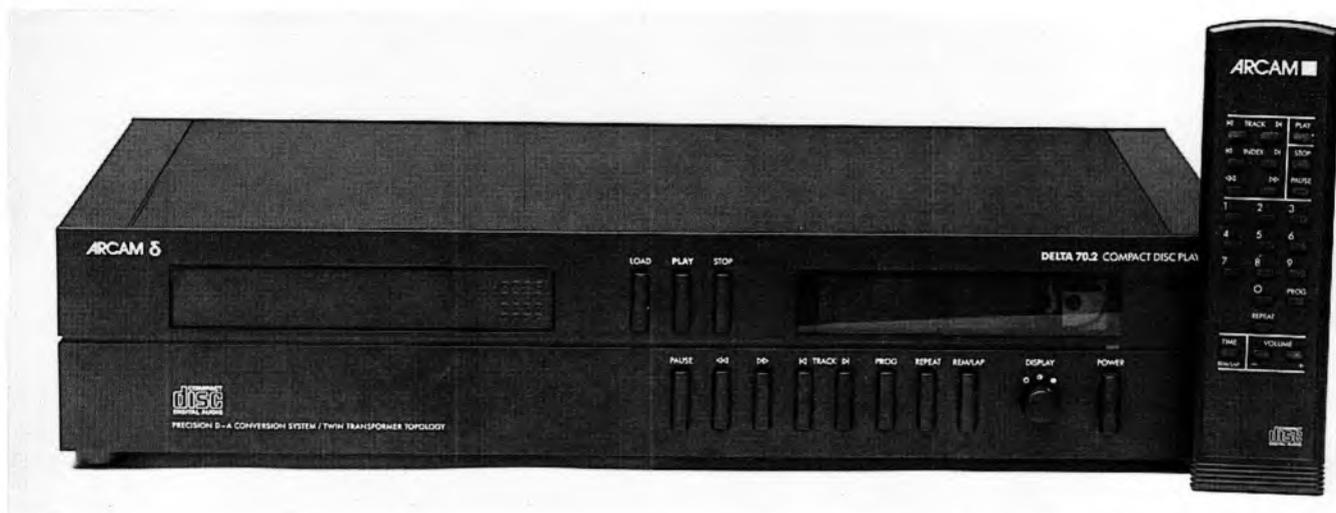
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ARCAM DELTA 70.2

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

RECOMMENDED



Now in second generation form, this £550 Arcam player is one of those rare examples of a British designed and built CD player. Improvements include a die-cast laser transport subchassis (still sourced from Philips) with more elaborate power supply arrangements and extensive detail circuitry refinements.

As befits a high price player, this *Delta* is solidly built using a substantial metal case. All the controls operate smoothly and with good precision. Full function remote control is provided, while the main fascia carries a sensible line-up of basic operating functions – play, track skip etc. All the usual features are present including track programming, repeat etc, plus a digital output for use with an outboard decoder box or digital amplifier. One criticism is that the remote volume control is a seven-step limited-range device operating in rather coarse 3dB steps. I find that 2dB is the coarsest step practical for comfortable listening.

One enhancement for the new version is a three-way option on the display, from full illumination to reduced glare for low light situations, while a third setting switches off the display for potentially improved sound, due to reduced electrical noise levels within the machine.

LAB REPORT

The all-alloy case houses a completely reworked Philips system including a *CDM4* transport. The transformers (one for audio, one for digital) are sited on the left on this player whereas almost all others have theirs on the right. There are separate Arcam designed boards for each section. Ribbon cable links them together and the digital filter is buffered from the selected *S1* crown DAC by logic circuits.

The parts used are all good quality and film capacitors are much in evidence. Separate supplies are the general order of the day, however the audio $\pm 15V$ comes from shared discrete transistor regulators. The current-to-voltage conversion is done in Arcam's own discrete transistor op-amp and this is follo-

wed by a *NE5534* op-amp output stage. An *LF411* is used in a DC servo loop to allow the analogue output to be DC-coupled. The remote volume control is a thick film type.

Output level is 1.55dB above the 2V normal and is fed from a low source impedance of 24ohms. The low level linearity test curve fades slightly after –80dB, but the errors are small – only 2dB at –90 and –100dB. The 4mm gap error correction capability reveals that the machine is well set up. Elsewhere, the other measurements are textbook Philips.

SOUND QUALITY

When originally introduced, the *Delta* CD player was liked well enough, though it did not set any new benchmarks. In *Mk2* form it shows a worthwhile sound quality improvement via the fixed output, though the sound via the fairly crude variable output was less impressive, and was closer to the original version.

Rated a substantial 'good' overall, the *Delta 70.2* is a clear and informative design showing fine stereo perspectives and sound stage layering, if a mite 'up front', falling a little short in absolute stereo depth. The presentation conveys fine drive and involvement, while the bass is articulate and punchy, with good low level resolution. Compared directly to the more expensive Arcam separates, this one-box *Delta* player sounds a trifle graceless – perhaps more enthusiastic than subtle – but delivers a fine sound nonetheless.

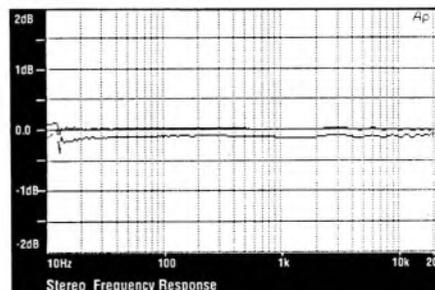
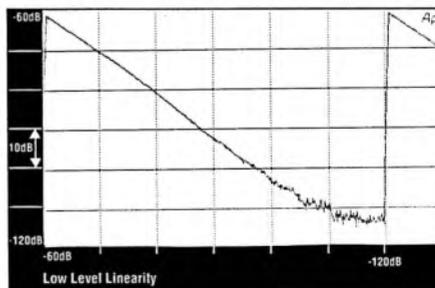
CONCLUSIONS

The many design refinements instituted for this *Mk2* version have resulted in both better test performance as well as better sound – a worthwhile result.

I find the primitive remote volume control of rather dubious value, but fortunately this doesn't detract from the fine sound obtained via the fixed level output. The build quality is high throughout and this solid Arcam contender certainly deserves a Recommendation.

TEST RESULTS

Test resolution (L/R av)	15.7 bits		
Output level, source impedance	2.39V, 1.55dB, 24kohms		
Effective dynamic range	109dB		
Harmonic distortion Ref 0dB	20Hz	1kHz	20kHz
	–92dB	–86dB	–90dB
	(0.0025%)	(0.005%)	(0.003%)
Ref –70dB		–38dB	1.26%
Stereo separation	102dB	101dB	95dB
Stereo balance L/R	0.13dB	0.13dB	0.1dB
Frequency response (20Hz to 20kHz)	± 0.06 dB		
High frequency intermodulation	–96dB (0.0016%)		
Electrical noise (CCIR ARM, 1kHz)	–105dB		
Mechanical noise	low		
Ultrasonic noise	–112dB		
Error correction	4mm gap		
Shock/vibration resistance	very good		
De-emphasis	+0.08dB at 5kHz		
Track finding speed (15, YEDS 2)	3.5 secs		
White noise overload test	OK		
Size (w x d x h)	43 x 28 x 9.1cms		
Typical price inc VAT	£550		



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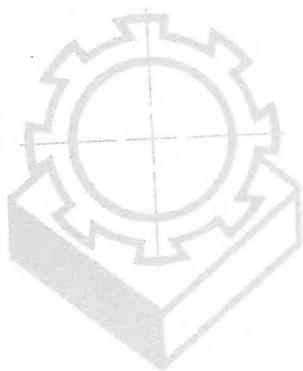
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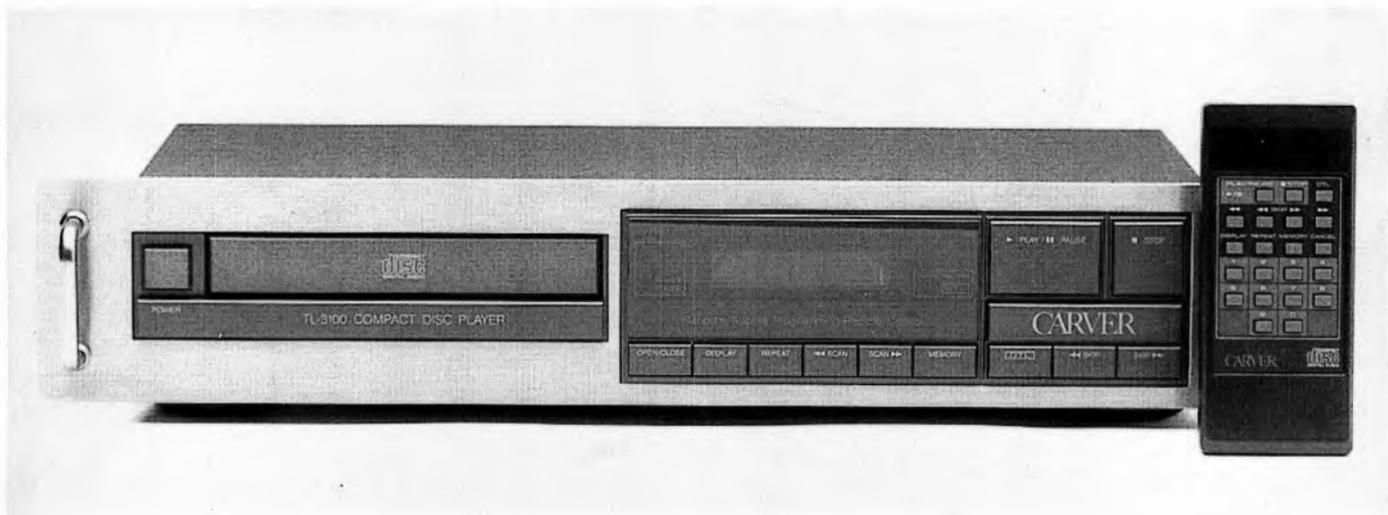
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Successful US firm Carver is best known for a line of compact and economical power amplifiers which began with the famous *Cube*. The mercurial Bob Carver always manages to add a certain something to his products, both in appearance and technical features: this CD player has a device called the Digital Time Lens or *DTL*. (The player powers up in *DTL* mode, and this needs switching out for normal use.) Carver suggests that when compared with analogue CD sound is 'evaporated into a flat, brittle wasteland'. Based on comparing 23 CDs to their analogue equivalents, Carver claims that the CD medium has excess energy above 400Hz and that the degree of L-R difference information differs by about 1.25dB. The *DTL* feature aims to correct this supposed imperfection.

Little more than a lightweight Japanese player under the skin, the superb frontal styling and finish suggests a far heavier and more costly design. There are even rack-mount style handles, and I really like the silver grey finish with its range of shades and textures. Facilities are limited - for example, there is no power volume, headphone socket or digital output - but this means that the operating controls are correspondingly straightforward, and the player is presented more as a discrete hi-fi component than a flashy machine. Given the display area available, numbers are quite small and hard to read at a distance.

LAB REPORT

The mains input connections to the board which rests on the top of the small transformer are unshrouded. The transformer secondary is taken to the main board for rectification and smoothing by a couple of Rubycon 2200 μ F 25V power supply electrolytics.

The transport is a conglomerate of plastic and pressed sheet steel - nothing special; just the standard Japanese chassis complete with worm-drive laser motor. At the output, following a couple of dual-in-line op-amps the special Carver circuit board incorporates a delay circuit (time lens) and dual-in-line op-amps, coupled by non-polar capacitors.

Two samples of this player were measured, as the first developed a fault which caused it to clip asymmetrically. Although the white noise test revealed no full level peak clipping, the total harmonic distortion at full level was higher than many, and at low levels the distortion is still worse than average. Stereo separation is good on the normal setting, but falls to 17dB at all frequencies when the time lens is switched in. Stereo balance, however, remains good.

The error correction circuits manage a creditable 2.4mm, and shock and vibration resistance is good. De-emphasis is accurate and the frequency response flat save for a slight high frequency filter ripple.

SOUND QUALITY

The *3150* was primarily assessed in 'normal' mode to provide meaningful comparison with the competition. The *DTL* mode was later engaged for subsequent auditioning.

Rating rather below average, this player tends towards a thin, forward sound on orchestral strings, with some associated brashness in the treble. Cymbals do not ring quite true and are reproduced with some additional fizz. Stereo images have reasonable space, depth and width, and with average focus, while bass speed and dynamics are nothing special.

With *DTL* engaged, there's a subtle shift in three areas: stagewidth, ambience and tonal balance. The sound is beneficially richer, but far depth is reduced at the expense of a greater but closer reverberant field, while stage width is clearly reduced and mild shifts of positional focus are detected in the front of the soundstage. The sound is slightly slower still and appears thicker and more congested in the lower midrange. Although the effect is interesting, it is not to my personal taste.

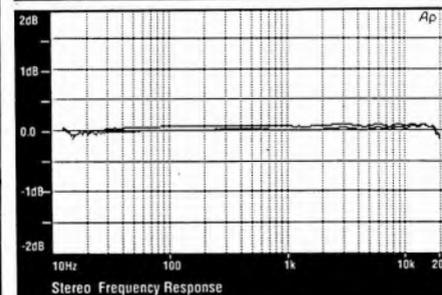
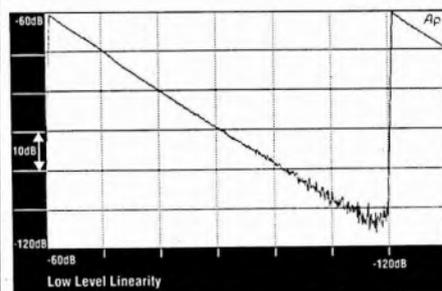
CONCLUSIONS

Capable of selling itself on the basis of fine appearance alone, this moderately priced Carver player has to be evaluated in the light of its original Digital Time Lens feature. Since in our view this detracts from a sonic

accuracy which was already rated below average in normal mode, formal Recommendation is not appropriate. However, you're advised to try *DTL* and judge for yourself.

TEST RESULTS

Test resolution (L/R av)		15.8 bits
Output level, source impedance	2.12V, 0 Ω , 520ohms	
Effective dynamic range		94dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-67dB -70dB -75dB	
	(0.04%) (0.03%) (0.02%)	
Ref -70dB	-25dB	6%
Stereo separation	17dB	17dB
Stereo balance L/R	0.06dB	0.04dB
Frequency response (20Hz to 20kHz)		\pm 0.01dB
High frequency intermodulation		-56dB (0.15%)
Electrical noise (CCIR ARM, 1kHz)		-100dB
Mechanical noise		low
Ultrasonic noise		-93dB
Error correction		2.4mm gap
Shock/vibration resistance		good
De-emphasis		-0.03dB at 5kHz
Track finding speed (15, YEOS 2)		4 secs
White noise overload test		OK
Size (w x d x h)		48.5 x 26 x 9.4cms
Typical price inc VAT		£340





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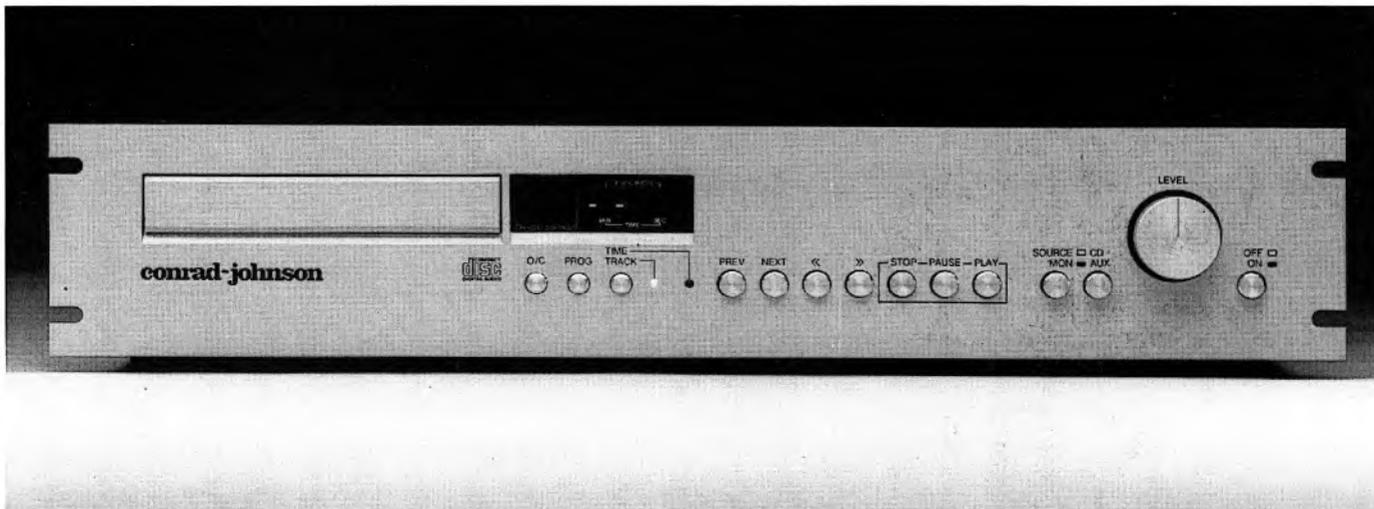
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CONRAD-JOHNSON DF1

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Conrad-Johnson's latest design, the £2,000 *DF1* owes much to the earlier and less costly *Sonographe*, and the main transport elements and technology used here are similarly derived from an early Philips 14-bit machine. The rationale behind such a model is CJ's skill in incorporating its audiophile experience and practice to elevate the sound quality level significantly. The company's own electronics and casework are major components, but the *DF1* has an additional application, since it combines a line/aux preamplifier with the CD player, and this is based on the noted all-FET *Motif* series. The player therefore has a top quality volume control and can drive power amplifiers directly, while a couple of auxiliary sources may also be used, such as a tuner or tape deck.

The finish is to CJ's usual high standards, the gold anodised finish and clean styling making a refreshing change from the ubiquitous high-tech keyboards that litter most modern machines. In terms of facilities it may be regarded as something of an American version of our own Meridian 207 player, though it lacks the latter's rather more elaborate remote control capabilities.

LAB REPORT

The basic Philips transport is built into a classic all-metal case with solid aluminium front panel. The D/A circuitry is now on CJ's own printed boards, and is assisted by top quality passive components including some exclusive high value polypropylene and polystyrene film capacitors. The circuitry is discrete FET, a single-ended capacitor-coupled design.

No vinyl disc equalisation is included in the preamplifier section, though this can otherwise handle a variety of line level sources. Its primary value is as a high quality buffer for the top quality volume control, and to facilitate direct connection to appropriate power amplifiers.

With valve-like low feedback circuitry, the measured performance of this model is unlike any other, save perhaps the aforementioned *Sonographe*. The low output level

makes A/B auditioning difficult, while neither distortion nor channel separation results are anything to enthuse over. The error correction is fine, and good low level linearity was also shown despite the use of early, over-sampled 14-bit technology. The phase inversion at the main output is slightly disturbing, especially since the normal fixed level CD output is phase correct. A mild 'sweetening' of the top end frequency response is evident, sufficient to be clearly audible in a high quality system.

SOUND QUALITY

First auditioned via its fixed output terminals, the *DF1* immediately set a high standard and was rated 'very good'. Reminiscent of the *Sonographe* but with superior dynamics and clarity, it clearly takes its place in the top group of available players. However, it should perhaps be pointed out that it benefitted from tens of hours of running in time before auditioning; from cold, it improved steadily over the first half hour.

Focus was not its strongest point, but this player was very capable of reproducing spacious, ambient stereo images with good recovery of any natural recorded acoustic. Generally tidy over the whole frequency range, mildly soft bass shows good tune playing abilities and rhythmic drive, while the treble had that characteristic mild coloration which has always been associated with the original '14-bit' Philips digital filter. The line/preamplifier is a respectable sounding unit and drove our test power amplifiers well. This section of the *DF1* player deserves to be taken seriously and must be included in the value equation.

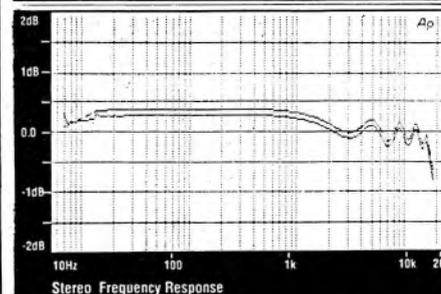
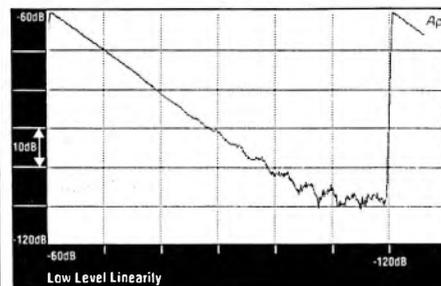
CONCLUSIONS

Something of a loner, this player has some market justification despite its very high price and odd mix of technologies. The sound is certainly pretty good, and value for money is enhanced by the decent line preamplifier included in the package.

Certainly the *CJ DF1* is worth seeing and trying out.

TEST RESULTS

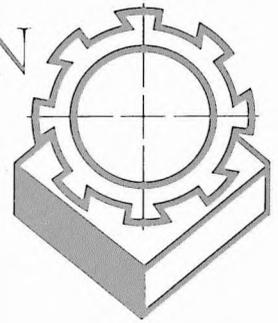
Test resolution (L/R av)		15.6 bits	
Output level, source impedance	1.2-10V, -5dB, 820/380ohms		
Effective dynamic range		98dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-50dB	-51dB	-62dB
	(0.33%)	(0.3%)	(0.17%)
Ref -70dB		-35dB	1.5%
Stereo separation	63dB	62dB	49dB
Stereo balance L/R	0.11dB	0.11dB	0.15dB
Frequency response (20Hz to 20kHz)			±1.2dB
High frequency intermodulation			-56dB (0.15%)
Electrical noise (CCIR ARM, 1kHz)			-88dB
Mechanical noise			some
Ultrasonic noise			-60dB
Error correction			1mm gap
Shock/vibration resistance			adequate
De-emphasis			-0.15dB at 5kHz
Track finding speed (15, YEDS 2)			4 secs
White noise overload test			OK
Size (w x d x h)			48.3 x 31 x 9.3cms
Typical price inc VAT			£1995



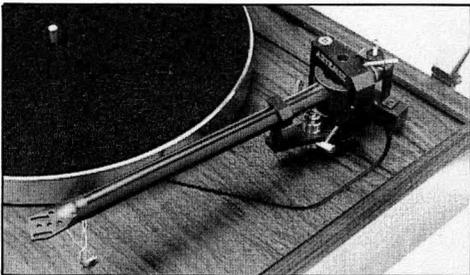
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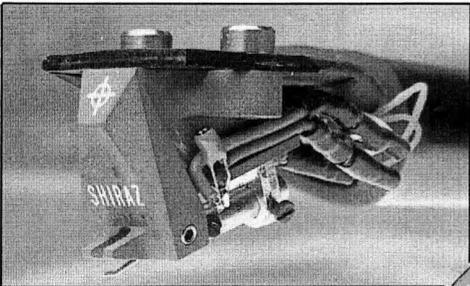
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RECOMMENDED



This model's 810 predecessor was not as strong a performer as its 610 or 910 siblings, but the new £250 820 sets out to put matters right. On appearance and facilities alone, it has a good chance of this, although the '20-bit' legend on the front panel relates only to the digital filter, not to the more important audio converters.

Selling for £250, this full width model is well equipped, and in truth is almost indistinguishable from luxury models costing twice the price. A noteworthy feature is the permanently engaged remote volume control, which on this occasion remembers the level when the deck was last switched off. The remote handset is a particularly neat example of the genre, yet manages to replicate most of the buttons on the feature laden front panel, including a ten-key direct track entry.

The fluorescent display is a reasonable size and shows track numbers, times and index points supplemented by a small music calendar section. Operational modes and 'emphasis' are also displayed, while the time button selects overall or elapsed timings. A front panel headphone socket and level control are also provided.

To offer all this at a modest price must require some economies elsewhere, so the construction is fairly light, with a thin enamelled metal top cover and a predominantly plastic moulded, albeit fairly rigid, case-chassis. The solitary digital output is a coaxial phono electrical type, alongside a conventional analogue audio stereo pair.

LAB REPORT

The 820 is well enough constructed, following the usual Denon pattern of braced plastic box with steel lid and insert base panel. The plastic loading tray sits on a rigidly mounted pressed steel chassis, which houses the spring and rubber decoupled rack and pinion laser transport. As the drawer closes, this laser subchassis moves up to clamp the CD against a rigid top clamp plate.

The main PCB is finished in green lacquer which doesn't follow the established Denon

pattern. A fairly small power supply delivers current to Sony digital chips which include the digital filter and analogue circuitry. Burr Brown PCM56P 16-bit digital-to-analogue converters are used with NE4558 IC output op-amps, while the digital filter and RAM have their own board set at right angles to the main PCB.

The stereo separation shows some asymmetry at higher frequencies, but as the results are good anyway, it seems churlish to complain. Furthermore, stereo balance is excellent. The frequency response has a minute amount of high frequency lift and some sign of filter ripple; there's a greater error on de-emphasis. Ultrasonic noise is well down, but the signal-to-noise ratio is slightly poorer than expected; dynamic range is assessed at 102dB, some 10dB less than many players in this issue.

Low level linearity is in error below -70dB, with the worst channel some 6dB out by the negative kink at -90dB.

SOUND QUALITY

After some confusion concerning output level and the remote volume control's ability to remember its previous setting, we finally settled down to audition this player. Focus and stage width is about average, while the impression of stereo depth is quite good. The bass sounds tidier and better controlled than usual, if a bit coloured, but musical dynamics are just plain average.

Problem areas include some 'glare' and 'forwardness' which makes massed orchestral strings sound a bit 'loud'. The midrange is a little thin in tonal balance, and treble focus is below average, despite good perceived definition. Ultimately, the sound is a bit 'hyped up', and the rhythm of dance style rock material was rated average or a little below.

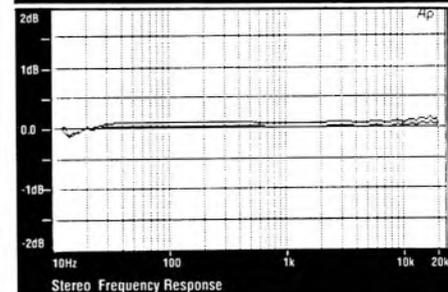
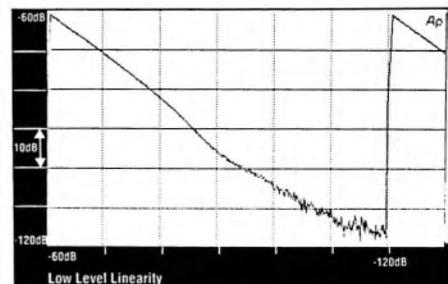
CONCLUSIONS

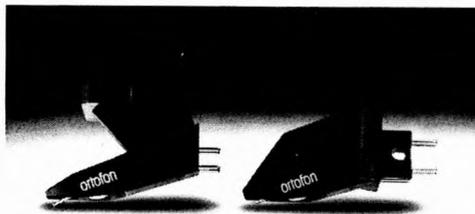
Although the sound quality is unspectacular by current standards, this player is still sufficiently competent for other aspects to enter the equation. Take into account the high

quality remote volume control and the fine finish and build quality and a Recommended rating is inescapable, given the modest price. Such a player can only help continue consolidating Denon's strong position in the UK market, even if the sound quality could be more competitive.

TEST RESULTS

Test resolution (L/R av)		15 bits	
Output level, source impedance	1.86V, 0.63dB	900ohms	
Effective dynamic range		102dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-85dB	-88dB	-89dB
	(0.0056%)	(0.004%)	(0.0036%)
Ref -70dB		-30dB	3.16%
Stereo separation	107dB	115/125dB	84/100dB
Stereo balance L/R	0.04dB	0.04dB	0.06dB
Frequency response (20Hz to 20kHz)			±0.15dB
High frequency intermodulation			-81dB (0.009%)
Electrical noise (CCIR ARM, 1kHz)			-94dB
Mechanical noise			low
Ultrasonic noise			-110dB
Shock/vibration resistance			good
De-emphasis			+0.3dB at 5kHz
Track finding speed (15, YEDS 2)			3.5 secs
White noise overload test			OK
Size (w x d x h)			43.5 x 30 x 10.6cms
Typical price inc VAT			£249





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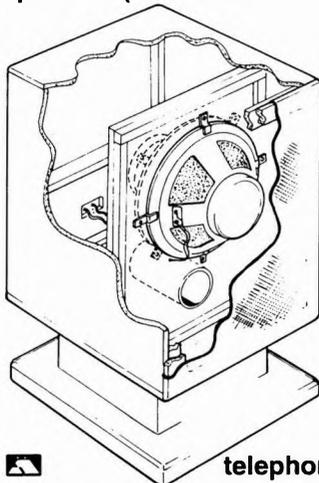


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DENON DCD 1420

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Denon's new £400 *DCD 1420* is a clear example of the company's strategy to bring in many of its top line features and technology at a more competitive price level. Featuring 20-bit decoding and 8 times oversampling with dual DACs, I will leave the technology for the lab report and concentrate here on the features which adorn this substantial full-width model. In sheer size terms it resembles one of those 140W per channel Japanese amplifiers, although in truth the casework is neither particularly substantial nor heavy.

Well endowed with outputs, coaxial and optical digital (transport mode) bitstreams supplement the two sets of audio outputs, one fixed and one under remote control. A headphone output has its own manual level control. The control panel bristles with buttons, including a ten-key set for rapid track entry, audio edit and auto space to aid cassette dubbing, random or shuffle play, and comprehensive repeat modes. Various display modes are available and index points can also be accessed.

The panel layout is straightforward, and the buttons feel fairly positive; all panel controls are duplicated on the well designed remote handset. The highly informative fluorescent display shows track, index and time, together with a 20-track calendar. CD single (8cm) discs can be played.

LAB REPORT

The 20-bit resolution is achieved here by using no less than four Burr Brown *PCM54HP* 16-bit digital-to-analogue converters, with their associated de-glitching and op-amp output circuitry. Like the other Denons, the *1420* uses Sony digital chips and the standard chip regulators use the metal chassis as a heatsink. The small transformer is connected to unshrouded mains inputs, and feeds the secondary to 2,200µF 16V main reservoir capacitors.

There's nothing special in the parts department, and standard commercial quality components are used. The display PCB is separated from the main area of the interior

by the front panel of the case. The transport has a plastic base with a compliant suspension for the suspended steel and plastic sub-chassis which carries the rack and pinion laser and the clamp arm system. No damping material is used on any of the panels.

The *1420* is perfectly happy with full level signals, as the harmonic distortion and inter-modulation distortion results show. Stereo separation reduces to a minimum of 80dB(!) at 20kHz, and there's some slight error in channel balance, but the excellent low level linearity ensures very good distortion figures and a wide 116dB dynamic range. The error correction level of 1mm is good enough for all but badly damaged discs, and resistance to shock and vibration was found to be good. The frequency response has a mild bass boost and some very high frequency rolloff, while the de-emphasis response has some mid emphasis.

SOUND QUALITY

This player generated mixed reactions in the listeners, due to an odd blend of strengths and weaknesses. Soundstage ambience is fine, creating an impression of depth, yet performances are considered rather 'close up', flattening the stereo perspectives of sounds recorded close to the microphone. Ambience is oddly separated from the main sound.

Dynamics are better than those from the Denon *820*, for example, with a cleaner, better balanced mid and treble, though treble focus is again not that good. The *1420*'s main strength lies in the bass, where it rises comfortably above the average in terms of slam and tune-playing abilities. Weighing up the pros and cons, the overall sonic rating is below average, but only marginally so. And given the unusual performance mix, personal audition could be well worthwhile.

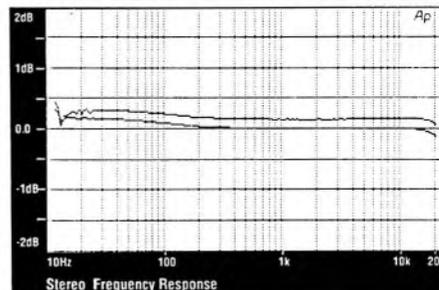
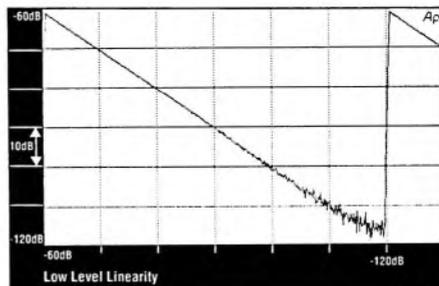
CONCLUSIONS

With the upmarket 20-bit *3520* and *1520* flagship models both firmly established, the *1420* seeks to bring 20-bit performance into a more competitive market sector. In truth,

the machine is closer to a *820* than a *1520*, both in build and sound quality terms, the latter worthy enough but not exceptional. Technically it performs well, is well built and versatile, and as such misses recommendation by only a small margin.

TEST RESULTS

Test resolution (L/R av)	15.9 bits	
Output level, source impedance	2.09V, 0.38dB, 350ohms	
Effective dynamic range	116dB	
Harmonic distortion	20Hz	1kHz
Ref 0dB	-91dB (0.0028%)	-92dB (0.0025%)
Ref -70dB	-43.5dB	0.67%
Stereo separation	123dB	102dB
Stereo balance L/R	0.15dB	0.13dB
Frequency response (20Hz to 20kHz)	±0.2dB	
High frequency intermodulation	-90dB (0.0032%)	
Electrical noise (CCIR ARM, 1kHz)	-101dB	
Mechanical noise	low	
Ultrasonic noise	-110dB	
Error correction	1mm gap	
Shock/vibration resistance	good	
De-emphasis	+0.38dB at 5kHz	
Track finding speed (15, YEDS 2)	3.5 secs	
White noise overload test	OK	
Size (w x d x h)	43.5 x 30.5 x 13.5cms	
Typical price inc VAT	£400	



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A quick phone call to your Shop to find out whether you had them in stock and I was lectured on how a Music System should be purchased . . . "Have you listened to it? How do you know you will like it's sound? It isn't the same as buying a washing machine, when it has to be taken on faith that it will do the job as you want it. It is more like buying a musical instrument, where personal preference dictates. You do not need to be an expert, you only need to listen to it and decide for yourself . . ."

Not too keen on the lecture, I was, none the less, taken up by what he said, and decided to pay you a visit. This turned out to be QUITE AN EXPERIENCE! After listening to a few systems I had already decided I would be buying my own combination and not the one recommended in the magazine. A music system should, indeed, be listened to, before purchasing. In addition, the personal attention, friendly, untiring and "non pushy" attitude of your sales assistant, Jas, turned the daunting prospect of choosing the right hi-fi into a most pleasant experience.

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GOODMANS GCD 555

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RECOMMENDED



This Japanese made multi-player is the latest in a successful line of low cost CD players which has helped UK specialist Goodman's extend its activities into a broader sector of consumer electronics. The 555 can carry six discs at a time, using interchangeable magazines, and also has simple infra-red remote control. The slim handset carries all the essential features, and will allow a six pack to be programmed in a relatively straightforward manner. The memory extends to 32 tracks, or just over five selections per disc, which is cutting it a bit fine.

There is also a repeat mode, which operates for one track, one disc or even a whole set, which could be useful in 'musak' applications. 8cm CD 'singles' cannot be used in the present magazines. The audio outputs are fixed, and no digital outputs are fitted. This player seems quite substantial in appearance and build, with clearly labelled control buttons and a fairly tough metal case.

LAB REPORT

The 555 uses technology more typical of a couple of years ago. It has the industry standard Burr Brown *PCM56P* 16-bit digital-to-analogue converter, which gets its data from a Sony 2x oversampling digital filter. The analogue circuitry consists of dual-in-line op-amps and a heavy LC filter at the output.

All the parts are of standard commercial quality, from the small transformer and power supply capacitors to the minimum use of discrete regulators. Being a multichanger the deck is 'upside down', with the worm and rack laser at the top. None of the steel panels which make up the case have any damping, but elsewhere the construction is well up to scratch.

The measured output is 0.5dB down on the CD standard and comes from a high 1.8kohms source impedance. No clipping is seen on the full level white noise signal and the total harmonic distortion at 20Hz and 1kHz is par for the course, but from a full level 20kHz there's some higher than usual in-band products (some 63dB down). Distortion is affected by low level linearity anomaly

lies at the -70dB level, but is not severe as the fade-to-noise test shows.

The electrical signal-to-noise ratio is a little on the high side, though ultrasonic spurs above 20kHz are well suppressed and there is rather more mechanical noise than elsewhere. Error correction copes with a 1.5mm gap, which is fairly good given that the 555 is an inexpensive multichanger, and the track finding speed (to disc three track 15 on the Sony YEDS7 test disc) is a rapid enough ten seconds.

SOUND QUALITY

In view of the worthwhile advance seen in overall player quality over the past year or so, it was a bit of a let down when this budget changer gave us a taste of what CD sound used to be like. Rated just satisfactory, the *GCD 555* only generates a mild degree of stereo depth and shows clear limitations in focus and clarity. Significant veiling is a fair comment.

The treble is untidy by current standards, the sound displaying a 'spikey' sibilant emphasis, while violins are a bit 'screechy' and the midrange tonal quality is thinned, with a forward, 'loud' effect. Stereo perspectives are compressed.

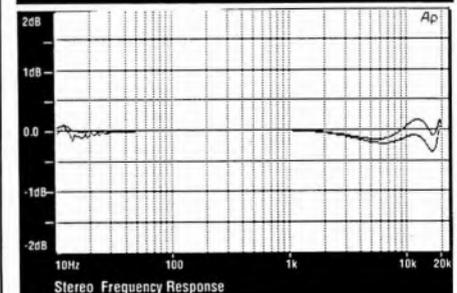
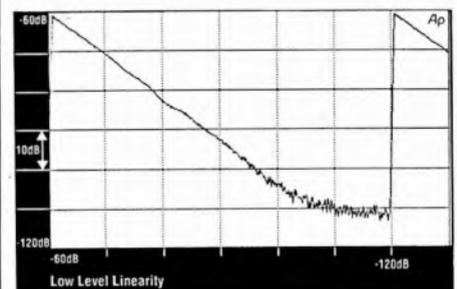
Distinctly below average, this player lacks articulation and sounds spongy in the bass. Neither dynamics nor rhythm are particularly strong, so ultimately it will have to survive on the basis of its moderate price and the changer facility. Indeed, given its low price the 555 is unlikely to find its way into high resolution hi-fi systems anyway.

CONCLUSIONS

Despite our negative reactions to its sound quality, the 555 shares with its predecessor a low enough price for a multichanger to deserve Recommendation. The player does work, has a just satisfactory sound plus reasonable technical performance and sets some sort of baseline standard for budget autochangers.

TEST RESULTS

Test resolution (L/R av)	15 bits		
Output level, source impedance	1.89V, -0.5dB, 1.8kohms		
Effective dynamic range	98dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-83dB (0.007%)	-84dB (0.006%)	-63dB (0.007%)
Ref -70dB	-29dB	-35%	
Stereo separation	97dB	93dB	71dB
Stereo balance L/R	0dB	0dB	0.04dB
Frequency response (20Hz to 20kHz)	±0.6dB		
High frequency intermodulation	-82dB (0.008%)		
Electrical noise (CCIR ARM, 1kHz)	-84dB		
Mechanical noise	some		
Ultrasonic noise	-112dB		
Error correction	1.5mm gap		
Shock/vibration resistance	very good		
De-emphasis	+0.16dB at 5kHz		
Track finding speed (15, YEDS 2)	10 secs		
White noise overload test	OK		
Size (w x d x h)	42 x 34 x 10cms		
Typical price inc VAT	£219		



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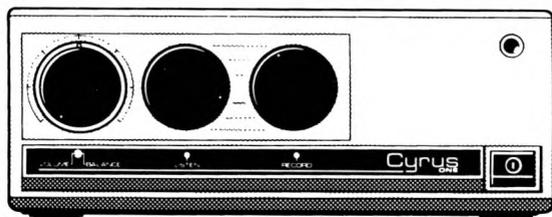
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This unusual full width player breaks the mould with a fascia part finished in titanium – a sort of dark silver grey – along with an ultra simple layout. Only two operating controls are visible – drawer open/shut and play/pause – besides the power 'on' switch, headphone jack and volume control. That is until you pull down the magnetically latched, hinged flap on the lower section, which reveals the usual spread including a 1-10 and '10+' keypad, full repeat facilities and comprehensive arrangements for dubbing to cassette – editing and timing control for sides A and B.

Particular features include a full function remote control with a power volume facility (fixed and power variable audio output sockets are provided). Up to 32 tracks may be programmed in any order and index points may also be accessed. There's an automatic fade, a display mode (to show various timings) and 'display off' (which can be less visually disturbing and may even result in a marginal improvement to the sound). CD singles can be played directly and the display includes a calendar type track indicator. Comprehensive connection for JVC ancillaries is provided on the rear panel, as well as two switchable digital outputs, one optical and the other wired phono. Spelling could be tightened up on for the fascia graphic which proclaims FULL-TIME LINER 18-BIT, denoting linear, non-switching 18-bit decoding. This machine uses four DACs in a sum and difference mode, driven by an 8x oversampling digital filter.

LAB REPORT

The internal mains wiring is well shrouded on its way to a decent sized transformer. High current diodes and large 50V 2200µF high quality reservoir caps comprise the 15volt audio supplies, with a decent selection of additional caps for the other circuitry. Much use is made of selected film capacitors in the audio section, alongside Burr Brown PCM56P 16-bit DACs together with JRC NE5532D op-amps. The basic construction is on four boards, joined by a bridged board and

edge connectors; one handles audio, another digital control and (Yamaha) digital filters, while the joining board houses some logic circuits, optical coupling isolators from Hewlett Packard and the digital outputs.

The transport is fairly basic, using a linear worm drive laser head, all mounted on a steel plate decoupled by rubber mounts from a basic plastic chassis; the laser and disc drive are moved up to a fixed clamp. Everything is neat and well ordered.

The output is close to standard from a moderate 300ohms source impedance, and absolute phase correct. A fine 113dB dynamic range is achieved and harmonic distortion is low at all modulation levels, both for single and mixed high frequency tones. De-emphasis and frequency response are accurate, channel balance and separation are very good, and CCIR ARM (1kHz) weighted audible noise is a fine -101dB.

On absolute resolution this player was -3dB out at -90dB modulation, but its overall ability is demonstrated by a linearity graph which stays impressively straight right down to -115dB. Error correction is fine, shock resistance is good and mechanical noise is low.

SOUND QUALITY

We expected more from this imposing model, the rather below average sound quality rating something of a disaster considering the price involved. Rock enthusiasts will attack it for a bass which sounds soft and inarticulate, slow and out of tune. The upper bass has a puffy, 'bumpy' coloration and lacks a real sense of definition.

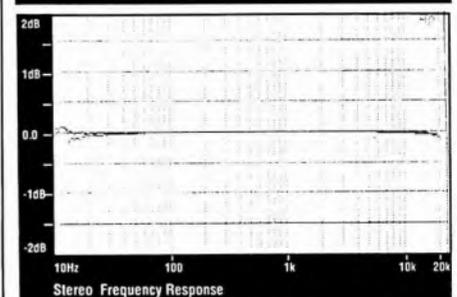
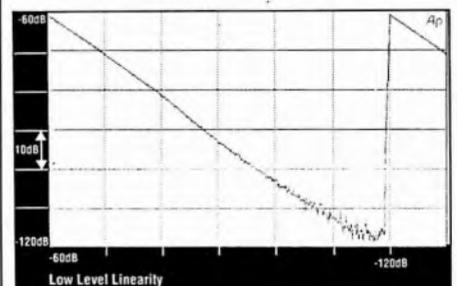
Taken overall, the presentation lacks air and the lower treble is 'forward' with a hint of 'glare' on orchestral strings. On complex and higher level sections, clarity and definition are lost, but lower level material sounds rather better. Stage width is good but central focus is diluted and the recovery of ambience and depth is unexceptional. None too tidy in the high treble, close-mixed vocals demonstrate increased 'edge' and 'lisp', and in toto the sound lacks coherence or direction.

CONCLUSIONS

A feature-packed player, this JVC is well built and finished, offering a decent set of lab results which unfortunately cannot be reconciled with an indifferent sound quality.

TEST RESULTS

Test resolution (L/R av)			15.5 bits
Output level, source impedance			2.1V, 0.4dB, 300ohms
Effective dynamic range			104dB
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-94dB	-95dB	-92dB
	(0.002%)	(0.002%)	(0.003%)
Ref -70dB			-34dB 1.41%
Stereo separation	130dB	110dB	84dB
Stereo balance L/R	0dB	0dB	0.02dB
Frequency response (20Hz to 20kHz)			±0.1dB
High frequency intermodulation			-88dB (0.004%)
Electrical noise (CCIR ARM, 1kHz)			-101dB
Mechanical noise			low
Ultrasonic noise			-113dB
Error correction			1.5mm gap
Shock/vibration resistance			good
De-emphasis			-0.03dB at 5kHz
Track finding speed (15, YEDS 2)			3 secs
White noise overload test			OK
Size (w x d x h)			43.5 x 37.5 x 11.3cms
Typical price inc VAT			£499



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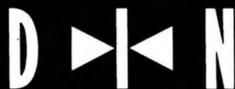
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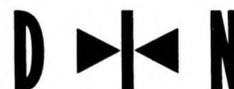


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Elements in the styling of this player are reminiscent of the Proton model also included in this issue, but in this instance the NAD is of Japanese manufacture, whereas the Proton is built in Taiwan. Simply laid out, the control buttons have a nice tactile response and the unit is easy to drive, aside perhaps from the lack of a quick track entry keypad.

It is, after all, a baseline model, priced at only £170. The only outputs are audio at fixed level; no headphone socket or digital output is provided, nor even remote control (the latter facility is available on NAD's 5325). Up to 20 tracks can be programmed in any order, while the simple display shows one mode at a time - track number, remain time, or index, according to the operation of the appropriate buttons.

The machine can handle both sizes of disc. The case is all metal and quite robust for this price range, but the less said about the integral feet the better!

LAB REPORT

The basic construction is familiar enough with one principal board on to which most of the control, digital decoding and analogue amplifiers are placed. The digital chips are mainly from Sanyo and this includes the part-bitstream dual DAC which is covered by a NAD sticky label proclaiming 'DAC'.

A small transformer with a semi-shrouded mains input connection feeds on-board 2200µF 25 volt electrolytic capacitors, followed by a minimum number of chip regulators. All the passive electronic circuit elements are of standard commercial quality, and the analogue output op-amps are JRC in-line types.

The worm drive laser mechanism is mounted on a rubber decoupled pressed steel chassis, while the plastic loading drawer has a mineral loaded disc clamp. The case is of light steel panel construction with no damping applied to any part.

The output level is a little up on the normal at 2.2V and there is some asymmetric clipping on the white noise test signal. The harmonic distortion on the left channel is

poor, and it isn't anything special on the right channel either. This was also the case with the intermodulation test. A few dBs down from full level the problem had gone, so it isn't as serious as it may appear on the surface. At lower output levels all the distortion figures are close to those expected.

Stereo separation is slightly asymmetric at low frequencies but has corrected itself by 1kHz. Error correction manages an unexceptional 0.75mm gap, and resistance to shock and vibration is considered average. De-emphasis is accurate in the midband, and like the ordinary response shows a slight droop at high frequencies. The low level linearity shows hardly any error right down to the noise floor, close to -120dB.

SOUND QUALITY

This player's clean and tidy fascia was unfortunately not complemented by an equally clean and tidy sound. A touch lightweight in tonal balance, it sounds more muddled and congested than usual when reproducing louder and more complex orchestration. String tone rates fair with some grain and 'edge', and although the treble is not unpleasant, it lacks the clarity and definition possessed by many rivals.

Stereo focus is only satisfactory, while stage width is average and depth below average. Dynamics and transient definition are both mildly impaired, and the panel commented that the sound was rather like that of an older generation budget player - worthy enough in its day but now overtaken by the competition. More slam and power would have been welcome in the bass and its rhythmic capabilities are also below par.

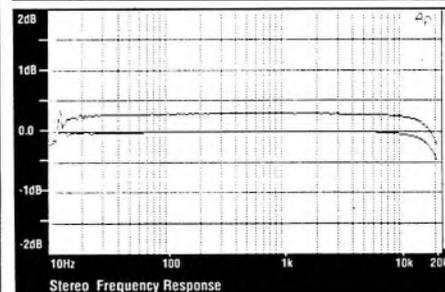
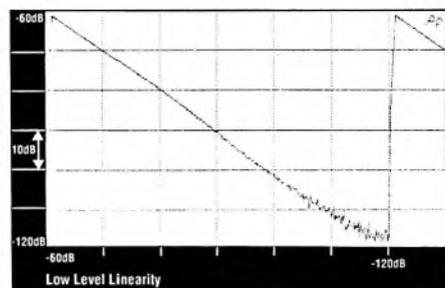
CONCLUSIONS

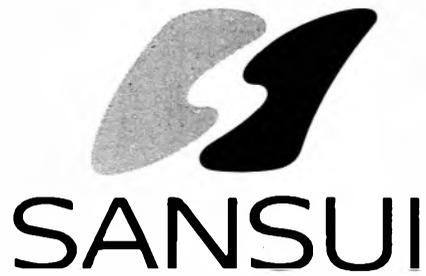
The part-bitstream technology looked interesting, both build quality and test results are generally good, while the styling is clean. However, NAD does not appear to have made much recent progress in the area of CD player sound quality, and the 5320 reflects this. Sufficiently competent to avoid being written off, this player is clearly not good

enough to compete with the class leaders, despite its modest asking price.

TEST RESULTS

Test resolution (L/R av)	15.5 bits	
Output level, source impedance	2.2V, 0.83dB, 470ohms	
Effective dynamic range	97dB	
Harmonic distortion	20Hz	1kHz
Ref 0dB	-28/67dB (4/0.04%)	-29/84dB (3.5/ 0.06%)
Ref -70dB		3.16%
Stereo separation	113/94dB	95dB
Stereo balance L/R	0.21dB	0.2dB
Frequency response (20Hz to 20kHz)	±0.3dB	
High frequency intermodulation	-29/56dB (3.6/0.16%)	
Electrical noise (CCIR ARM, 1kHz)	-108dB	
Mechanical noise	average	
Ultrasonic noise	-94/104dB	
Error correction	0.75mm gap	
Shock/vibration resistance	average	
De-emphasis	-0.03dB at 5kHz	
Track finding speed (15, YEDS 2)	4 secs	
White noise overload test	asymmetric clip	
Size (w x d x h)	42 x 23 x 8.6cms	
Typical price inc VAT	£169	





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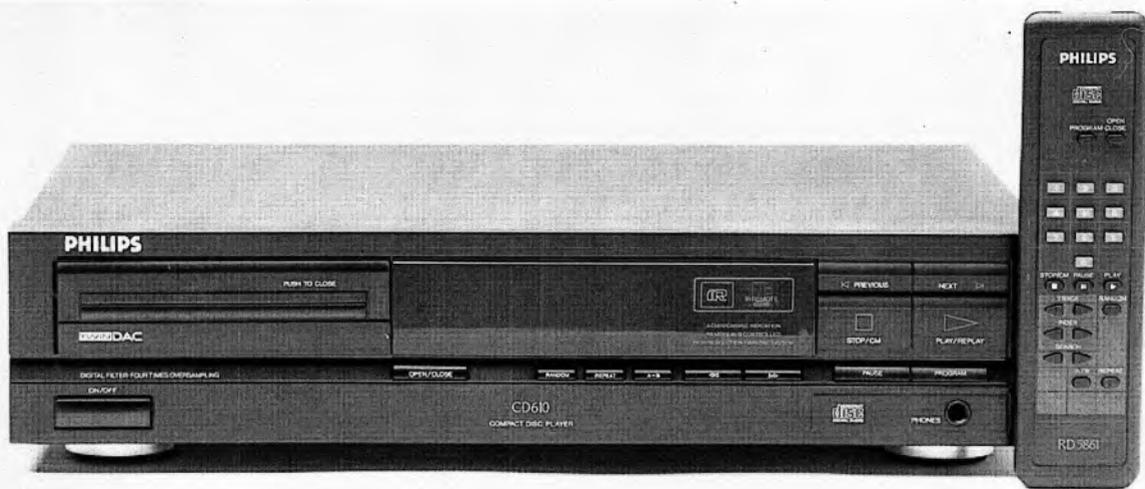
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PHILIPS CD610

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BEST BUY



There's some irony in the observation that Philips has led the race to cut CD player prices year by year, while at the same time petitioning the EEC to raise tariffs on imported machinery. A true budget machine, the £160 *CD610* is the latest in a succession of models which aim to minimise purchase costs, and as a result it does feel rather cheap and plasticky in operation.

It has remote control, but in keeping with the budget price, this is a simple affair; neither remote nor player have numeric keypads for direct track entry. A headphone socket is provided but without any associated level control. The control buttons are positive and this full width machine will accept both disc sizes. The display is nice and clear, showing track number and time plus a linear readout of tracks remaining and/or programmed.

Repeat modes include 'all' and programmed phrase, while play modes include random, normal and programmed. The audio output is fixed, at nominally 2V from a pair of phono sockets. Nothing important seems to have been omitted, save perhaps a direct digital bitstream output.

LAB REPORT

For this player Philips has developed a new plastic box with considerable cross bracing strengthening for both the case and the transport mounting. The transformer is fixed directly on to the printed circuit board, which in normal Philips style carries all but the display and control buttons. However, unlike the other recent Philips players, this model uses the cheap eight-pin DAC which was first seen in the Toshiba *9128*. The standard *SAA720P/A* 4x oversampling digital filter is used.

The passive components used are of a lower grade than those found in the *TDA1541* bedecked players, but analogue circuit execution looks similar, using the *LM833* dual op-amp for current-to-voltage conversion and output buffering. Even the headphone socket is buffered with the same *JRC4560D*. The transport is the familiar

CDM4, with weighted disc clamp.

In comparison with Philips players using the more normal *TDA1541* DAC, this model measures less well in many respects. The output level is lower and comes from a fairly high impedance of 930ohms. Total harmonic distortion is on the high side (comparatively speaking) and some slight asymmetry and clipping was noted on the white noise overload test. Stereo separation is rather average and intermodulation distortion is up on the right channel. The signal-to-noise ratio is also somewhat poorer than the Philips norm. The fade-to-noise test reveals that although the low level linearity of the right channel is very good, the left channel is a mite too strong below the -70dB level.

SOUND QUALITY

Although this player demonstrates the expected Philips 'house sound', it does not come up to Philips' usual highly competitive standard, scoring 'average' or fractionally below overall. Timing and rhythm are above average, and musical dynamics are quite interesting and involving. A fair impression of stereo depth is evident on simpler passages but the soundstage is flattened and there was a clear loss of clarity and detail on more complex excerpts.

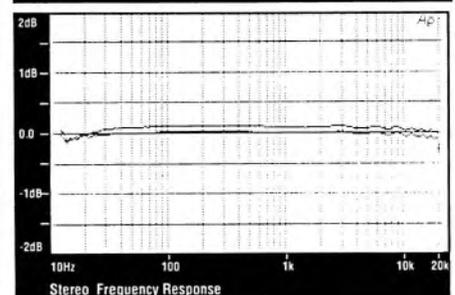
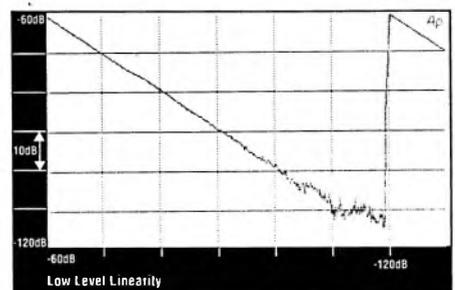
Violin tone is a little 'wiry' and the treble sounds a little more brash and grainy than on better Philips decks, although it is still very competent by the standards of this survey. Stereo focus is rated about average, stage width is good and space and ambience reproduction is quite satisfactory. The sound is not let down by a bass which achieves an average score despite the player's modest price.

CONCLUSIONS

Consider the *610* as a *582* with a reduced technical budget. All the latter's facilities have been retained, while the measured performance and the sound quality has suffered little as a result of the 20 per cent price cut. Nevertheless, performance and value remains embarrassingly (for the competition that is!) good, ensuring yet another 'Best Buy'.

TEST RESULTS

Test resolution (L/R av)		15.6 bits
Output level, source impedance	1.83V, -0.77dB	930ohms
Effective dynamic range		103dB
Harmonic distortion	20Hz -78dB (0.013%)	1kHz -78dB (0.013%)
Ref 0dB		20kHz -84dB (0.006%)
Ref -70dB		-33dB 2.24%
Stereo separation	78dB	97dB
Stereo balance L/R	0.09dB	0.08dB
Frequency response (20Hz to 20kHz)		±0.1dB
High frequency intermodulation		-91/78dB (0.003/0.013%)
Electrical noise (CCIR ARM, 1kHz)		-90dB
Mechanical noise		low
Ultrasonic noise		-108dB
Error correction		4mm gap
Shock/vibration resistance		very good
De-emphasis		-0.01dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		slight asymmetry and clip
Size (w x d x h)		42 x 28 x 10.2cms
Typical price inc VAT		£160



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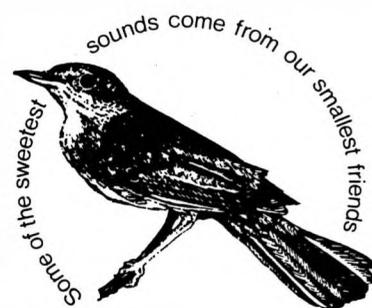
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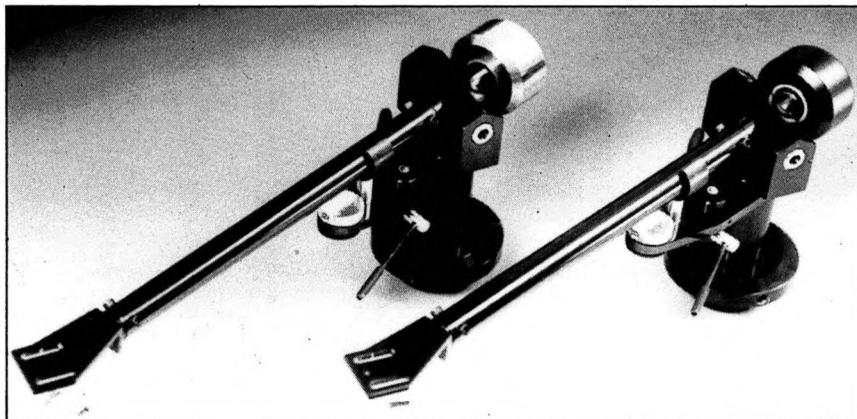
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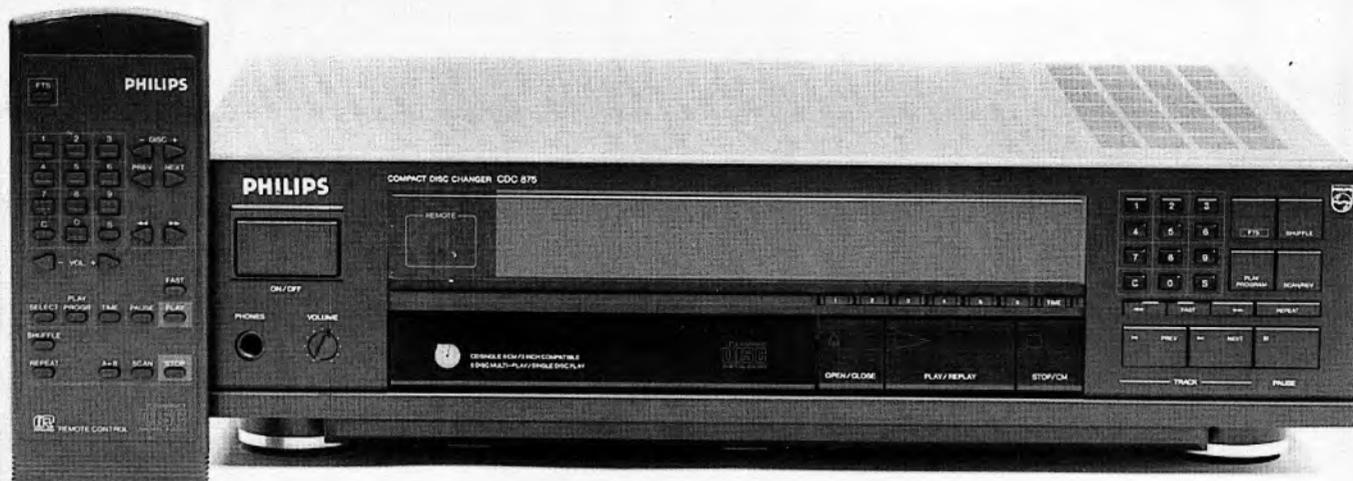
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PHILIPS CDC875

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It has taken some time since the introduction of the CD medium for Philips to get around to producing a multi-disc autochanger, but this omission is now rectified in the appearance of the £300 875. This machine has much in common with the well established single disc (£230) 782, using similar electronic technology plus the same remote volume control and audio circuitry. Hopefully the sound will be as good! The magazine capacity is six discs, and the player also incorporates the FTS feature – the large memory for favourite track programming system which is an ideal adjunct to a multi-play machine. CD singles may be loaded provided each is fitted with a clip-on ring.

The 875 is a full-feature machine with a comprehensive remote control, and a headphone socket with its own volume control. A ten-key track entry pad is fitted on both the remote and deck fascia. A versatile fluorescent display can show a track calendar of up to 20, plus disc number, track number and timings. Play mode facilities include full repeat (including A to B), shuffle play, scan etc. Outputs include a wired digital connection with fixed and variable audio outputs (seven steps of a rather coarse 3dB each, making 21dB overall), plus connections for the Philips system remote. The operating systems all work pretty well – Philips seems to have learnt from the mistakes of others here.

LAB REPORT

Assembled from two pressed steel halves, the case has damping material applied to its top panel. The autochanger mechanism is a complicated plastic moulded affair, but it retains the normal Philips swinging arm laser assembly, arranged upside down in this case. However, in this application the small sub-chassis is not spring mounted but rigidly bolted to the autochanger sub-assembly, itself rubber decoupled from the steel base.

The circuitry is fairly standard Philips, with the same control chips apart from the additions needed for multi-disc operation. A 4x oversampling digital filter feeds a TDA1541A dual digital-to-analogue conver-

ter. There are three printed circuit boards in toto, one mounted upside down above the other two.

Although the player is a multi-changer, there is little in this set of results to suggest it's any different from the standard model. Like many recent Philips players the output level is slightly below 2V these days, but the 200ohm output impedance remains. Stereo separation is exceedingly good and channel balance good enough. The error correction system is powerful enough to cover up a 4mm gap, albeit with a slight click at the start of the test track. The fade-to-noise test shows the typical response of a SAA7220B/TDA1541A digital filter/DAC combination, although the noise periodicity at very low levels is unusual. The frequency response is ostensibly flat and the de-emphasis circuits are accurately engineered. The time taken to find disc three and track 15 of the Sony YEDS 7 test disc was a reasonable nine seconds.

SOUND QUALITY

One might expect that Philips would be able to control sound quality at will throughout its varied range, but that just doesn't seem to be the case here. This player fell well short of the usual results and was rated at just satisfactory overall. It sounds surprisingly dull and veiled, yet also has a splashy and poorly defined treble. Transients are softened and blurred while ambience is oddly muted.

Slower than the usual Philips standard in the bass, dynamics are also softened, while stereo presentation is below par too. Stage width is restricted, focus barely average and the listening panel also noticed a loss of depth. A fine whiff of Philips' characteristic 'get up and go' fortunately saves it from disaster. The ability to get the musicians swinging along together in a reasonably rhythmic fashion has not deserted this player, even though it's a bit short of subtlety elsewhere.

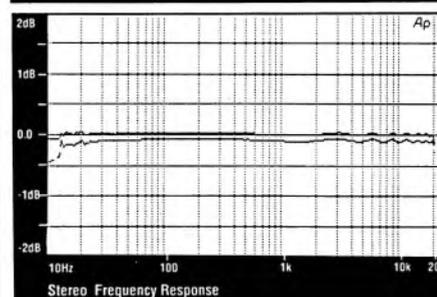
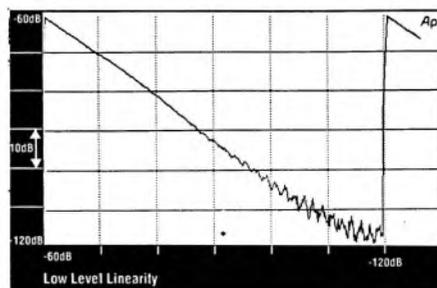
CONCLUSIONS

One would have liked to have seen the full measure of Philips sound quality provided in

this new autochanger, but in some mysterious way part of the magic seems to have been lost. Taken overall the performance is quite satisfactory, particularly in ergonomic terms, but the rather ordinary sound quality precludes formal recommendation.

TEST RESULTS

Test resolution (L/R av)		15.6 bits
Output level, source impedance	1.91V, -0.4dB, 200ohms	
Effective dynamic range		107dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-95dB -87dB -90dB	(0.002%) (0.005%) (0.003%)
Ref -70dB		-36dB 1.58%
Stereo separation	130dB 125dB 103dB	
Stereo balance L/R	0.11dB 0.1dB	0.14dB
Frequency response (20Hz to 20kHz)		±0.06dB
High frequency intermodulation		-104dB (0.006%)
Electrical noise (CCIR ARM, 1kHz)		-106dB
Mechanical noise		some
Ultrasonic noise		-111dB
Error correction		4mm gap
Shock/vibration resistance		very good
De-emphasis		-0.08dB at 5kHz
Track finding speed (15, YEDS 2)		9 secs
White noise overload test		OK
Size (w x d x h)		42 x 35 x 11.5cms
Typical price inc VAT		£300





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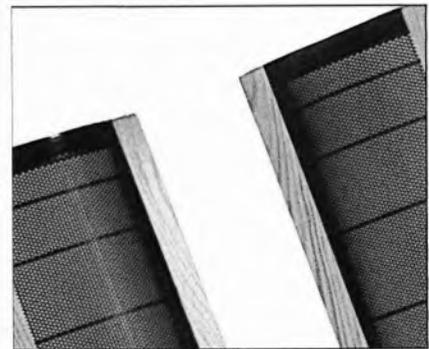
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PHILIPS CDV185

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

RECOMMENDED



Included in this report simply on the basis that it is just as able to replay CDs as the other decks in this report, the main extra here is of course the ability to replay video disc 'singles' – 12cm diameter gold coloured CDs offering six minutes of video alongside 20 minutes of CD audio. It will also play normal 12cm and 8cm 'single' audio CDs. Normal (RF) and SCART video/TV connections will help maximise performance in any AV arrangement, and there is also a digital audio output in addition to the audio pair on the usual phono sockets.

Presumably this machine is strongly aimed at the youth market; for the cosy tête à tête it has two front panel headphone sockets with a matching volume control. Elsewhere the operating facilities are pretty much like those of an ordinary CD player. The infra-red handset has programmable shuffle play, a ten-key track entry pad, repeat and display modes amongst other features. Sound may be muted and the unit held in a standby mode. Furthermore, the machine incorporates an on-screen graphic system which can display some 30 different messages via the TV screen – information on the kind of disc being played plus various operating states and commands – clever stuff, this!

LAB REPORT

The CDV facility on this machine results in a far more complicated internal construction than a standard CD player. The 185 has a solid steel chassis with a plastic subchassis structure on to which the various boards are mounted, interlinked by a complex wiring harness.

The transport is similar to a standard Philips CD player, but the laser transport is a spring decoupled, worm drive, linear tracker. The power transformer is larger than normal (to power the extra circuitry) and extra boards in a three-tier system accommodate the CDV facility. The analogue output board uses the standard Philips digital filter/DAC with the analogue output taken care of by a rarely used *TLA1542*. All the parts are basically standard grades, but good quality

output capacitors have been used.

The measured results on this player are very similar to those of a standard CD player such as a *CD582*. The output level is very slightly lower but then so is the output impedance. Intermodulation distortion is exceptionally low and the effective dynamic range is 110dB. Error correction is a very capable 2.4mm and resistance to shock/vibration is very good.

While the normal frequency response is textbook Philips, with the usual small high frequency ripple, the de-emphasised response shows greater error than normal – 0.7dB out at 16kHz. The fade-to-noise test reveals some linearity error below 80dB, but this is kept within 3.5dB.

SOUND QUALITY

Noting some mild transport noise – more than usual for a normal CD player – this CDV machine did rather better than Philips' CD multichanger, hitting the 'average' mark bang on the nose. The sound is satisfactorily open and articulate – not particularly impressive at first but with sufficient sense of pace and musical character to grow on the listener. Clarity is fine and the treble is tidy and well focused. Stereo soundstages demonstrate satisfactory width and good depth, coupled with a fair representation of low level ambience and space.

It does not sound as transparent as the best Philips budget CD players on complex material, but results are still respectable enough overall. Tighter, cleaner bass would have been welcome, yet rhythmic lines are handled pretty well. Given the capability and intended applications of this compact CDV player, the overall audio findings are pretty good.

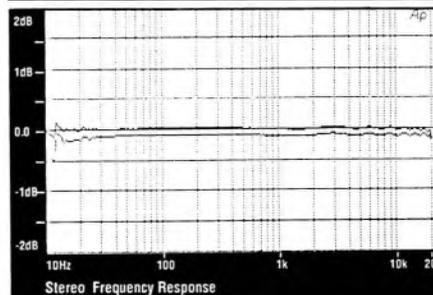
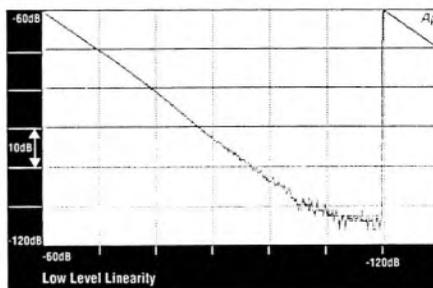
CONCLUSIONS

Its unique video capability makes this machine difficult to evaluate. The digital CD sound part of this player is certainly up to scratch, despite the complex and tightly packed interior. The video section seems subjectively fine too, so it may be confidently

Recommended for someone who wants a combined video singles and CD player.

TEST RESULTS

Test resolution (L/R av)		15.4 bits	
Output level, source impedance	1.93V, -0.3dB	152ohms	
Effective dynamic range		110dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-88dB	-87dB	-89dB
	(0.004%)	(0.004%)	(0.004%)
Ref -70dB		-38dB	1.26%
Stereo separation	101dB	105dB	95dB
Stereo balance L/R	0.11dB	0.11dB	0.08dB
Frequency response (20Hz to 20kHz)			±0.06dB
High frequency intermodulation		-105dB	(0.0006%)
Electrical noise (CCIR ARM, 1kHz)			-105dB
Mechanical noise			some
Ultrasonic noise			-110dB
Error correction			2.4mm gap
Shock/vibration resistance			very good
De-emphasis			-0.13dB at 5kHz
Track finding speed (15, YEDS 2)			4 secs
White noise overload test			OK
Size (w x d x h)			36 x 36.5 x 10.2cms
Typical price inc VAT			£350



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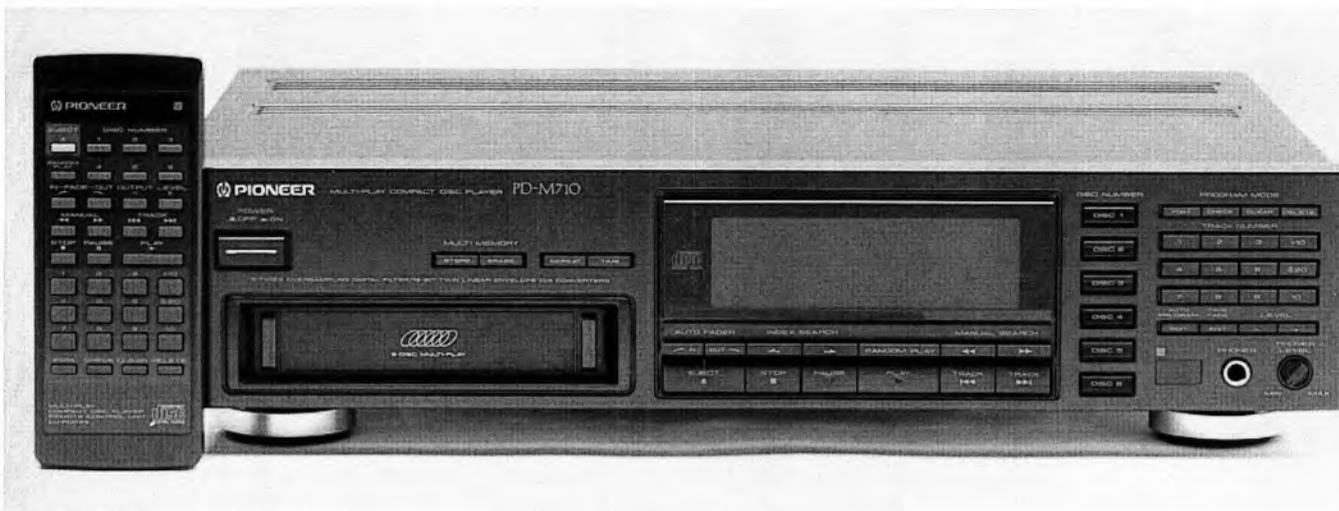
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PIONEER PDM 710

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

RECOMMENDED



Built in Japan, this £350 full width Pioneer disc changer is nonetheless quite slim. It is fully up to date technically, and is quoted as an 8x oversampling, dual 18-bit design. The multiplay facilities are particularly slick, operating with more haste than is usually apparently the case with multi-disc systems. Individual discs may be played using a supplied accessory magazine, but the machine can really come into its own when used with the six-disc magazines; up to 40 tracks may be programmed for each magazine! An additional 'Multi Memory' facility can permanently store these program sets and a preferred volume setting per disc for a total of 20 magazines; a large collection of discs can therefore be left permanently stored and filed using a set of magazines, enabling preferred tracks to be always selected if desired.

The 710 is also very well equipped in other respects. It has a headphone socket and level control, cassette editing, full repeat modes, plus a versatile remote control which includes a 0 to -25dB digital remote volume facility. Audio output only is available, via a pair of phono sockets; there's no digital output.

LAB REPORT

Unshrouded mains are revealed on the top of a board used to neaten the transformer connections, while the secondary is linked by ribbon cable to a main board with a decent quota of power supply capacitors and chip regulators. Most of the control circuitry comes from Sony. An 8x oversampling digital filter feeds separate Burr Brown *PCM58P* 18-bit DACs - a configuration which is fast becoming a standard amongst the non-bitstream grouping of Japanese manufacturers, albeit unusual in an autochanger.

The analogue circuitry consists of *JRC5532* op-amps and polystyrene capacitors. The multichanger has an upside down laser mechanism, which is decoupled on rubber bungs and uses a worm drive.

The no compromise approach has created a multichanger which measures very like the more conventional *PD-9300*. Total harmonic distortion at full level is exceptionally low,

and intermodulation distortion is even better. Stereo separation is well maintained at over 100dB to 20kHz, and channel balance is also good.

The frequency response has a very minor high frequency roll-off, and like the *PD-9300* there is an error on the de-emphasised response. Resistance to shock and vibration is good enough though the error correction circuits only managed a 0.75mm gap. Furthermore, the performance was assessed at 'only close to 16 bits', as the low level linearity test reveals a slight kink in the curve between -70 and -100dB.

SOUND QUALITY

This cheerful player actually beat the Pioneer flagship on our listening tests, simply by offering straightforward and uncomplicated delivery of our music test tracks. Admittedly it does not sound as refined - in fact on rougher mixes, some brashness and grain is evident, while string tone has a touch of brittleness - yet the *PDM-710* always succeeds in getting the message across.

The 'average' overall score is fine for the price. However, the bass could have been more extended, and the whole sound was judged slightly lightweight. Nevertheless, the stereo presentation is 'open' with respectable focus, worthwhile depth and good stage width. Hall ambience is provided in good measure.

Despite the lack of weight, it delivers a decent level of slam and has good dynamic qualities. Furthermore, it makes a good attempt at holding complex rhythmic patterns together - in such a manner as to make the top Pioneer CD player in this test group seem much less than totally convincing.

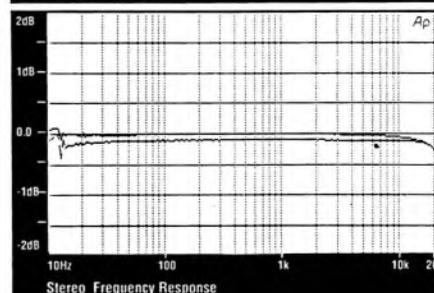
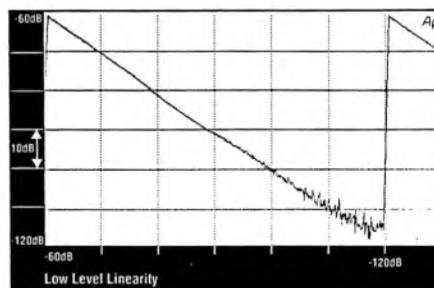
CONCLUSIONS

Pioneer seems to be most successful down at the competitive end of the CD player market, and this £350 changer with all the correct facilities is a good example, delivering the goods in terms of operation, lab results and sound quality. The sound is cheerful and involving, carrying a beat well, all of which

adds up to a convincing Recommendation. The non-changer equivalent should be as good, and offer even better value.

TEST RESULTS

Test resolution (L/R av)	15.7 bits		
Output level, source impedance	2.27V, 1.1kohms		
Effective dynamic range	112dB		
Harmonic distortion	20Hz	1kHz	20kHz
	Ref 0dB	-96dB	-95dB
	(0.0015%)	(0.0018%)	(0.0032%)
Ref -70dB		-39dB	1.12%
Stereo separation	135dB	124dB	102dB
Stereo balance L/R	0.1dB	0.09dB	0.01dB
Frequency response (20Hz to 20kHz)	±0.24dB		
High frequency intermodulation	-100dB (0.001%)		
Electrical noise (CCIR ARM, 1kHz)	-107dB		
Mechanical noise	average		
Ultrasonic noise	-118dB		
Error correction	0.75mm gap		
Shock/vibration resistance	good		
De-emphasis	-0.3dB at 5kHz		
Track finding speed (15, YEDS 2)	2 secs		
White noise overload test	OK		
Size (w x d x h)	42 x 32.5 x 10.8cms		
Typical price inc VAT	£350		



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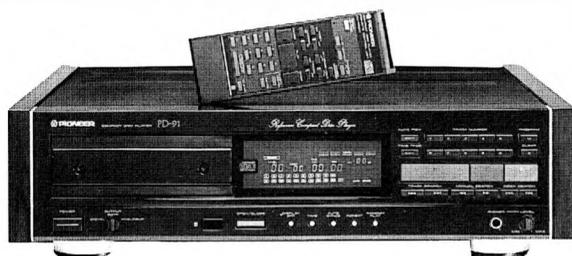
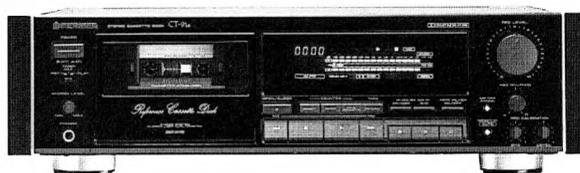
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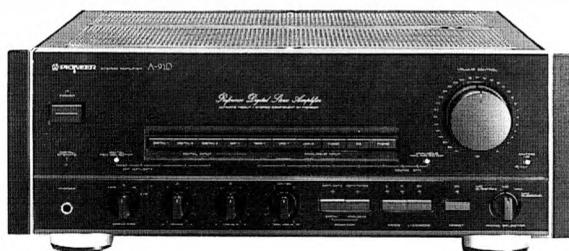


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PIONEER PD-9300

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



This upmarket £450 player conforms to a new styling practice (also seen in the Sony X7) which creates a heavier look by reducing the number of buttons, increasing the fascia height, and placing a narrow display above a centrally located disc loading drawer. Beautifully finished, the 9300 is robustly built and has a solid, well engineered feel about it.

Front panel controls include the usual transport functions plus a few extras such as 'display off'. When 'on', the latter can show elapsed time, total time, track remain time and total remain time, according to the time button cycle; normally it shows track number, index and track elapsed time. Both the remote handset and the player have ten-key direct track entry, up to 24 tracks may be programmed in any desired order, and yes, it also offers 'shuffle' play! Aiming at an audiophile image, neither headphone socket nor remote/power volume control are provided. Audio output is from a pair of standard fixed level phono sockets while two digital outputs are fitted - one optical, the other for wired connection.

LAB REPORT

The all metal chassis and even the screws are copper plated to minimise induced eddy currents. Unshrouded mains feed a large transformer which in turn feeds a separate board containing rectification and reservoir capacitors together with several regulators for various circuits; the digital board itself has even more reservoirs and regulators. Separate 18-bit Burr Brown *PCM58P* DACs are used for each channel, located with the analogue output circuitry on a separate board above the digital section. The datastream from the 8x oversampling digital filter on the lower board is taken to the DACs by ribbon cable.

The audio output stage uses *JRC5532* dual integrated circuits; copper foil polystyrene capacitors are found in the filter circuit. Left and right channels are separated by a copper bus bar, and even some of the electrolytic capacitors have copper foil shielding. The

laser transport is driven by a linear motor, and a magnetic disc clamp has a 3-inch disc stabiliser built in. It's all fairly neat, tidy and well sorted.

There is really very little to complain about in the measured results of this Pioneer, which delivers virtually state of the art performance in many areas. Points to note are the excellent rejection of ultrasonic noise above 20kHz and the low level of harmonic distortion at all levels. However, the error correction capacity is very average, and the de-emphasis response is a little out. Low level linearity is more or less perfect right down to -110dB.

SOUND QUALITY

This player sounds distinctly different from most of the rest of the field, possessing disconnected elements of an audiophile performance but without that overall sense of direction that is needed to tie it all together. Given its pedigree, the marginally below average overall rating is worrying, though the panel of listeners did find this one difficult to score.

There's a sense of fluid smoothness to harmonic textures through both midrange and treble, yet massed orchestral strings sound shrill, almost to the point of 'glare'. Instrumental definition is fine and focus good, but soundstage depth and space are not fully developed and the effect on the reproduced acoustic is of a contained dryness.

The bass has some good points, but also sounds boxy, emphasising the upper bass registers. Pace and rhythm were perceptibly slowed, and this made some rock tracks sound more like an academic exercise than a stimulus for foot-tapping swing. Elements of real quality are evident here, but ultimately more solid dynamics and a more coherent presentation is demanded from a prestige product such as this.

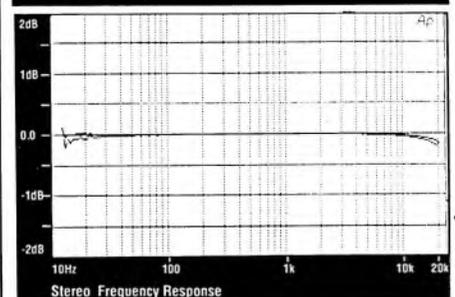
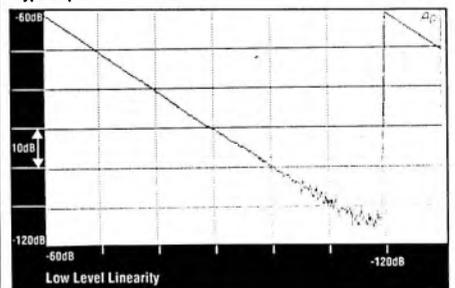
CONCLUSIONS

Billed as a cost effective version of the 18-bit *PD-9100* flagship, the 9300 is certainly much cheaper yet is still very well built. The lab

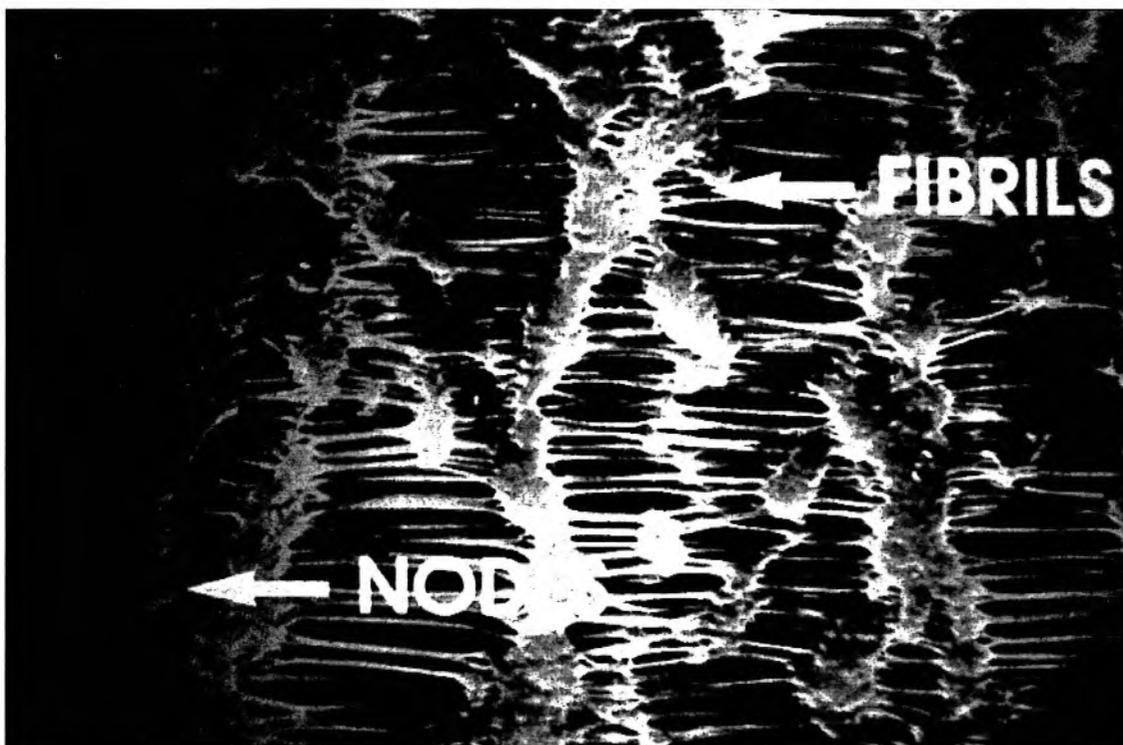
results are exceptionally good, but this should have provided a better sound than we got. Too close to the group average for recommendation, the panel had mixed feelings about various aspects of the sound quality, so this could be a model to audition first.

TEST RESULTS

Test resolution (L/R av)		15.8 bits	
Output level, source impedance	2.15V, 0.63Ω	470ohms	
Effective dynamic range		112dB	
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-96dB	-93dB	-90dB
	(0.0016%)	(0.0022%)	(0.0032%)
Ref -70dB		-42dB	0.79%
Stereo separation	123dB	90dB	113dB
Stereo balance L/R	0dB	0.01dB	0.07dB
Frequency response (20Hz to 20kHz)			±0.23dB
High frequency intermodulation			-87dB (0.0045%)
Electrical noise (CCIR ARM, 1kHz)			-107dB
Mechanical noise			low
Ultrasonic noise			-120dB
Error correction			0.75mm gap
Shock/vibration resistance			very good
De-emphasis			-0.25dB at 5kHz
Track finding speed (15, YEDS 2)			2.5 secs
White noise overload test			OK
Size (w x d x h)			42 x 33 x 12.6cms
Typical price inc VAT			£450



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PROTON AC-120

PORTFOLIO MARKETING LTD., WILDMERE RD., DAVENTRY IND. EST., BANBURY, OXON OX16 7GS. TEL: (0295) 271596.



This slim Taiwanese-built player is distinguished by good front panel design with clean labelling and a refreshing lack of loads of unnecessary buttons, though it's a pity the controls that are fitted do not have a more positive feel, particularly play, pause and stop. There's no digital output while the audio output is at standard fixed level, from nickel-plated phono sockets. The front panel has a headphone socket and associated level control, while the infra-red remote control has a ten-key array for direct track entry.

Up to 15 tracks can be entered into the programme memory – less than usual but probably enough for most records. The simple display shows track number, time or index according to the number of times the time key is pressed. This drawer loader can take both 12cm and 8cm singles, like most of the latest generation of machines. No adaptor is necessary.

LAB REPORT

The design of this player is typical of many of Far Eastern origins; most of the components emanate from Japan, but were assembled in Taiwan. There's a small transformer and minimal power supply in terms of capacitors and regulators. The mains are unshrouded. The main PCB has a few modifications on the board, sufficient to suggest that it was not totally sorted before being pressed into production.

Most of the digital chips come from Yamaha, including the 2x oversampling digital filter and 16-bit digital-to-analogue converter. The parts are of standard commercial quality and the general level of construction is workmanlike. The transport rests on a rubber decoupled subchassis and uses a worm drive laser and fairly flimsy pressed metal clamp arm.

On test, the Proton showed some problems in several areas. The total harmonic distortion was acceptable at low frequencies, but the in-band products of a single 20kHz tone were only -44dB and the 1kHz product of the twin high frequency intermodulation tones were at a similar level. Signal-to-noise

ratio is poor for a CD player, though ultrasonic spurious are well suppressed.

The frequency response shows a rather alarming high frequency rise (above 3kHz), but it must be remembered that the graph is of very high resolution and this peak is only 1.2dB at maximum. The de-emphasis circuits have rather large errors which are different on each channel; at 5kHz the left channel error is 1.37dB, which is too much. On the plus side, the fade-to-noise test reveals a line which is only very slightly curved in the positive direction – a good result for a cheap player.

SOUND QUALITY

This player sounds like an example of yesterday's technology – possibly 'recommended' two years ago, but not up to present standards. Rated merely satisfactory, first impressions were of a smeared treble focus, noticeable on orchestral strings and associated with a hardened 'wiry' tonal quality – a characteristic that is typically known as 'digital grain'.

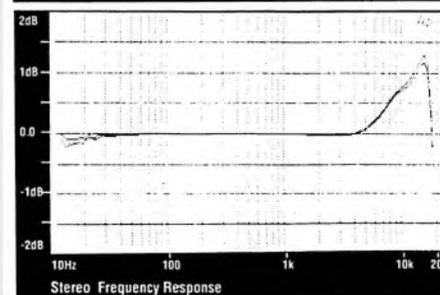
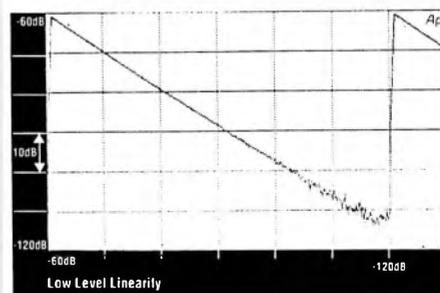
Stereo depth is only fair, as is the focus; nor is a full measure of stage width achieved. Bass lines are softened and the thinned tonal balance gives an impression of a curtailed bass extension. Vocal tracks show sibilance exaggeration, while complex musical arrangements frequently sound congested and muddled. The AC-120 does not put together rhythms particularly well, nor does this machine give full scope to dynamic expression.

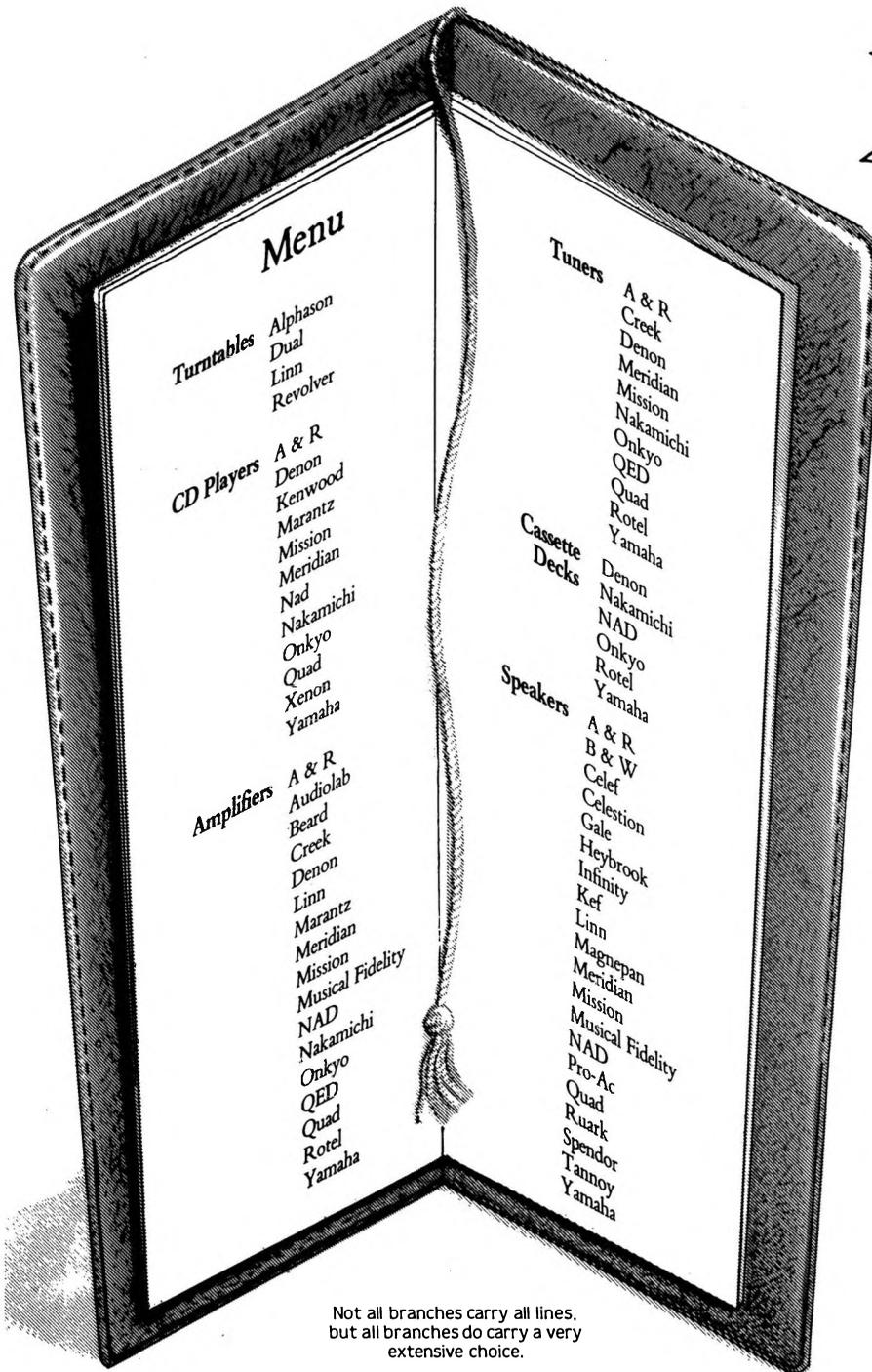
CONCLUSIONS

The styling is good – almost in the respected Braun idiom – but the sound is old fashioned and the lab results are just satisfactory. Such has been the development of CD player performance, this machine would have been regarded a good buy as little as two years ago, but these days you can expect a better sound than this even from budget models. Consequently, although the deck is quite well priced, the value for money is insufficient for recommendation.

TEST RESULTS

Test resolution (L/R av)			15.7 bits
Output level, source impedance		2.14V, +1.8dB	780ohms
Effective dynamic range			110dB
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-73dB	-73dB	-44dB
	(0.02%)	(0.02%)	(0.6%)
Ref -70dB		-36dB	1.5%
Stereo separation	82dB	82dB	75dB
Stereo balance L/R	0dB	0dB	0.13dB
Frequency response (20Hz to 20kHz)			-2.03dB
High frequency intermodulation			-46dB (0.5%)
Electrical noise (CCIR ARM, 1kHz)			-88dB
Mechanical noise			some
Ultrasonic noise			-101dB
Error correction			1mm gap
Shock/vibration resistance			average
De-emphasis			-1.4/0.4dB at 5kHz
Track finding speed (15, YEDS 2)			5 secs
White noise overload test			OK
Size (w x d x h)			42 x 30 x 7.8cms
Typical price inc VAT			£180





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REVOX B226S

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



This new £840 Revox player achieves a very high quality appearance with piano gloss bevelled side panels and matching satin black finish. It's a drawer loader, with an adaptor supplied for 8cm singles, and as it is anticipated that most of these players will be used as part of a matching Revox system, remote control for the player alone is an optional extra. Build quality and finish are to the usual high Revox standard - it looks impressive and weighs a substantial 8.5kg.

This latest in a series of *B200* CD players has all the usual features including remote control over volume. Fixed and variable audio outputs are provided, alongside two wired coaxial digital outputs. The liquid crystal display has pleasingly subtle illumination and shows track number plus various timings selected sequentially by a time button. Up to 19 tracks can be memorised in any desired order, index points may be accessed, and repeat play is included under the description 'loop'. A ten-key track entry pad is on both the player and the remote.

LAB REPORT

The CD transport is basically a Philips swinging arm type but has been extensively modified to provide very smooth operation. A large alloy-casting runs down one side from the front to the back of the player, a steel box section is bolted to this and the transport is sited in the middle which makes the whole structure very rigid. The transformer sits behind the transport and is therefore shielded from all the circuits.

Revox designed system control circuits sit on a board on the left side, while the right hand board houses the digital and analogue circuits. Good quality film and electrolytic capacitors are sourced from European manufacturers. *LM317/337* low noise chip regulators are used and the layout is efficiently organised. The latest type Philips digital filter drives an *S1* grade *TLA1541* DAC, and simple output filtering is constructed around selected *5532* op-amps.

As all the Revox players use the Philips digital-to-analogue converter system, it's

hardly surprising that the *B226S* measures like a Philips player. That the output is a little higher than normal is due to the feedback chosen on the current to voltage converter. The signal-to-noise ratio is up amongst the leaders, while intermodulation and harmonic distortion results are as expected - all good. The frequency responses are very accurate with and without de-emphasis and the fade-to-noise test likewise reveals typically accurate low level linearity. The effective dynamic range is large and ultrasonic noise is well suppressed. The mechanics work quietly and resistance to shock is good.

SOUND QUALITY

The sound of the current Philips CD integrated circuit technology may be clearly heard in this model, providing a base line of good timing, sensible dynamics and fairly good definition. However, the panel scores indicate a slightly below average rating, below that of certain budget Philips and Marantz clones. One might have hoped that Revox would have improved rather than diluted the brew, given this machine's considerable price.

The sound is essentially musical in the Philips mould, but some of the life and natural energy seems smoothed over. Treble is unexceptional in terms of clarity and grain, and there is less stereo depth and focus than with a Marantz *CD65SE*, for example. The bass is also unexceptional in both tune playing and specific articulation, though musical rhythms still hold together better than many Far Eastern competitors.

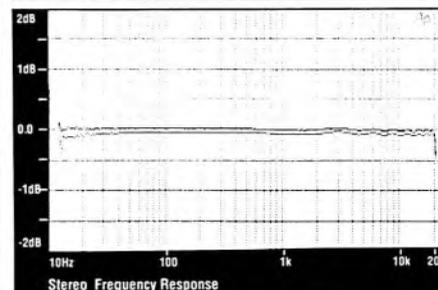
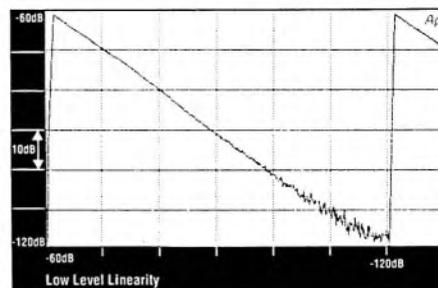
CONCLUSIONS

This new look Revox CD player incorporates some improved internal features, while finish and the build quality remain at the usual high Revox standard. The lab results are better than for previous models, and while the sound is basically 'good Philips', Revox does not show any particular flair in refining or tuning the recipe. It's a good player but doesn't offer sufficiently good value for

money to merit formal recommendation.

TEST RESULTS

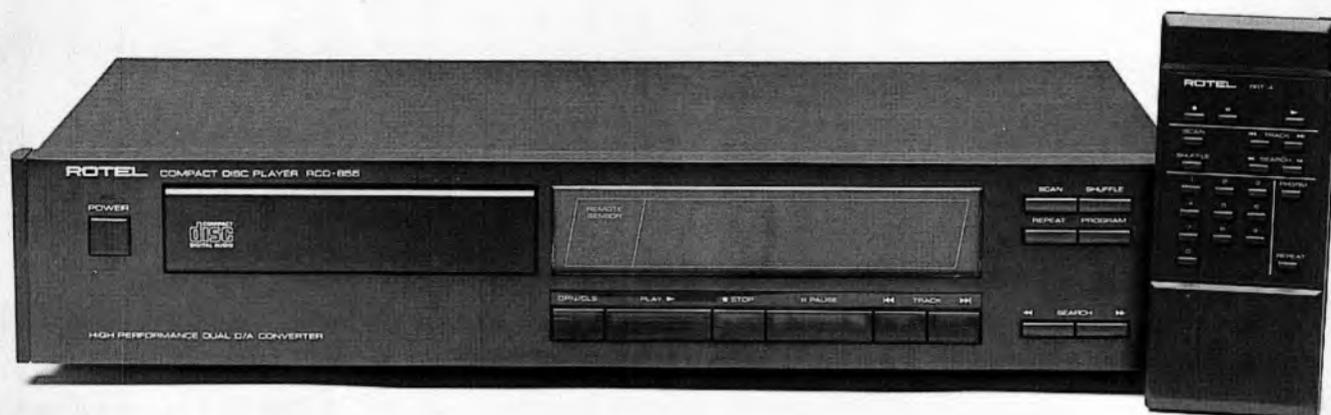
Test resolution (L/R av)		15.8 bits
Output level, source impedance	2.46V, 1.8 Ω , 220ohms	
Effective dynamic range		108dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-96dB -86dB -90dB	
Ref -70dB	-38dB 1.2%	
Stereo separation	120dB 113dB 85dB	
Stereo balance L/R	0.07dB 0.05dB 0.13dB	
Frequency response (20Hz to 20kHz)		\pm 0.06dB
High frequency intermodulation		-100dB
Electrical noise (CCIR ARM, 1kHz)		-108dB
Mechanical noise		low
Ultrasonic noise		-113dB
Error correction		4mm
Shock/vibration resistance		good
De-emphasis		-0.03dB at 5kHz
Track finding speed (15, YEDS 2)		3.5 secs
White noise overload test		OK
Size (w x d x h)		48 x 34 x 11.7cms
Typical price inc VAT		£840



ROTEL RCD 855

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

BEST BUY



Rotel's high reputation is long established and well deserved in the budget amplifier market, but so far similar success has been denied in the CD field. 'Best Buy' ratings have hitherto eluded the slightly expensive Philips clone machines built for Rotel at the Philips factory. Due to the requirement for large batch ordering from such a production facility, these players were usually half a step behind the latest designs.

However, the *RCD 855* is intended to change all that. Building on the latest Philips techniques and including the well established *CDM4* swing arm laser transport, this CD player is actually built at a Rotel plant, and has an entirely new design of circuit board. The substantial all-metal case is built of thicker than usual steel, while much design input and sound quality judgement has emanated from the engineering team at Rotel UK during its development.

It is a straightforward model on the features side, with 20-track programming plus shuffle play and repeat modes. The infra-red remote control has a 10-key numeric pad for quick track entry. Stripped down for a 'GT' performance, other features include a basic display showing track numbers and timings; no headphone facility is included, presumably in the interests of sound quality. Fixed level audio output is provided via a couple of gold-plated phono sockets; a single electrical digital output is also available.

LAB REPORT

Rotel has always based its players on Philips technology, and in the past has modified Philips printed circuit boards, though the *RCD855* uses a Rotel designed board. Elsewhere it is still based around a Philips chip set, including the *TLA1541A* DAC and *SAA72280B* digital filter, plus the latest *CDM4* disc playing mechanism.

The audio circuitry uses selected parts with top quality Black Gate electrolytic capacitors in important coupling and decoupling applications. The analogue output and current-to-voltage converter op-amps are selected *NE5532* devices, though FETs and

transistor switches are still used for de-emphasis and muting. The DAC uses film capacitors for current decoupling. The transformer is of reasonable size, but the majority of the power supply circuitry looks standard Philips. Unusually, Rotel has seen fit to logic gate buffer the digital output transformer from the digital filter.

Although the printed circuit board is changed, the measured results are very close to that for the standard Philips player on which it is based. Everything is therefore pretty good, and nowhere is there any real cause for complaint. The low level linearity test shows a near perfect result down to almost -100dB on both channels, but here it meets a slightly higher-than-Philips noise floor - still, neither should be of any real consequence.

SOUND QUALITY

Rotel's previous players have been competent but unexceptional, but the *RCD 855* succeeds in changing all that, racing away in the sound quality ratings. This mid priced player delivers a very good performance not far removed from the finest at twice the price. A shade light textured, even bright, listeners are rewarded with a big, spacious soundstage showing very good clarity and depth. Control of stereo focus is first rate, from the low bass to the uppermost reaches of the treble register.

The treble is revealing and detailed with little audible distortion, while the bass is articulate - a touch lean, yet with fine extension to low frequencies and a satisfactory, powerful 'slam'. Rhythm and dynamics are both handled very well, and this model provided much musical involvement and enjoyment for members of the listening panel.

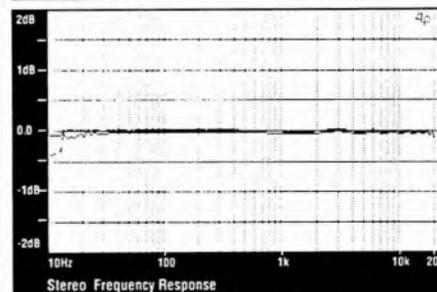
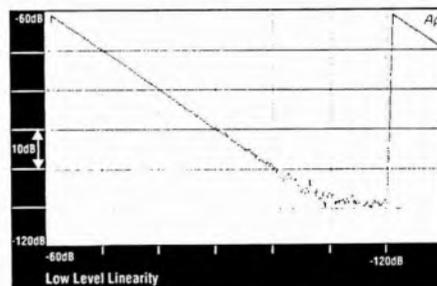
CONCLUSIONS

At last Rotel has a 'hit' CD player - a competitively priced, well equipped no nonsense machine in the *BX* mould, as a consequence of careful and total system redesign of established Philips technology. The results speak for themselves, since this most impressive

'Best Buy' can undoubtedly cause some sonic embarrassment to several more costly players in this issue.

TEST RESULTS

Test resolution (L/R av)	15.8 bits		
Output level, source impedance	2.03V, 0dB, 200ohms		
Effective dynamic range	106dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-94dB	-86.5dB	-90dB
	(0.002%)	(0.05%)	(0.003%)
Ref -70dB		-35dB	1.7%
Stereo separation	116dB	110dB	95dB
Stereo balance L/R	0.04dB	0.03dB	0.04dB
Frequency response (20Hz to 20kHz)	±0.06dB		
High frequency intermodulation	-103dB (0.001%)		
Electrical noise (CCIR ARM, 1kHz)	-109dB		
Mechanical noise	low		
Ultrasonic noise	-113dB		
Error correction	3mm gap		
Shock/vibration resistance	very good		
De-emphasis	-0.1dB at 5kHz		
Track finding speed (15, YEDS 2)	4 secs		
White noise overload test	OK		
Size (w x d x h)	44.5 x 31.5 x 8.6cms		
Typical price inc VAT	£250		





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RECOMMENDED



I was a firm fan of this model's predecessor, the 227, and note that the target price for this new model is a similar £400 even though the usual upgrading of features and facilities has taken place. A label stuck on the loading drawer advertises '8x oversampling 45-bit', a claim whose veracity will be examined later in the technical section. The machine is excellently finished in satin black, and in the usual Sony flagship tradition hardly any conceivable facility has been omitted.

Just listing them will make you breathless! We'll start with the full function remote handset, which includes power volume control over both the variable audio outputs and the gold-plated headphone socket. Fixed audio output sockets are also present and digital data is available in optical or wired form, switchable from the front panel. Facilities include programming for up to 20 tracks, random or shuffle play, continue, repeat and single track play. Direct track entry pads run to 20 keys on both player and handset.

Cassette dubbing modes, which when you've mastered the facilities make copying CDs onto cassettes a doddle, include time record, auto-space, fade and edit. Sony's 'custom file' system permits storage of favourite track selections (à la Philips), though without the written title display present on the more expensive models. The display includes a 20-track calendar (a Sony original), track and index numbers and timings. The whole unit feels quite substantial in build and has good metal feet.

LAB REPORT

It's interesting to compare the measured results with those of its more illustrious 338 brother, for it shares much of the same technology. Output level is slightly down, sufficiently so to confuse AB comparisons. Elsewhere the two measure very similarly, with the 338 just about scraping the lead in most departments.

No linearity errors are apparent on any of the '45-bit' digital filter and Burr Brown 18-bit DAC Sonys which we have tested, so let's

hope all the production is as good as this.

The metal exterior panelling conceals a strong plastic interior chassis. A '45-bit' digital filter at 8x oversampling feeds 18-bit double-mono DACs. Care has been taken to control vibration in both the mechanics and the audio sections, while the power supplies and audio circuitry use selected audio grade parts. A fast access, linear motor CD transport is fitted with good suspension decoupling, and even the lid of the player has been double laminated to counter microphony.

SOUND QUALITY

The bass tonal quality is quite convincing, showing almost perfect articulation with a good feeling of dynamic slam and definition. The treble is a touch bright, 'nickel' rather than 'chrome plated' – a touch wispy in the highest frequency range, yet showing good resolution of detail as well as a clean orchestral string tone.

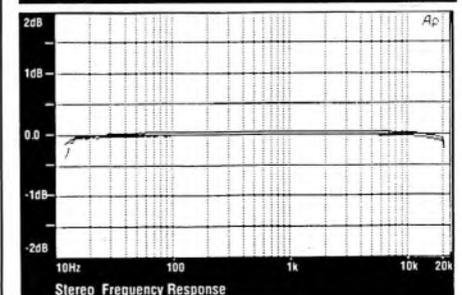
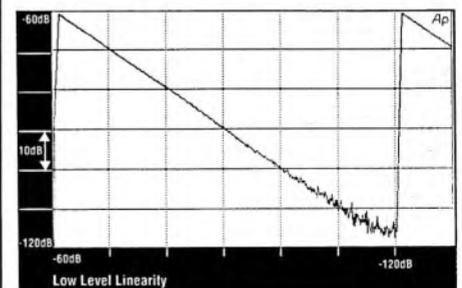
Stereophonically it sounds open and clear, delivering well focused, spacious soundstages with satisfying width and perspective. Midrange detail and tonal quality is fine, and it separates out the various musical strands on complex rock well – too well perhaps, as the result is mildly disconnected, the bass not perfectly in time with the mid rhythm, reducing the coherence of ensemble playing. Musical dynamics were rated as average and the final score placed this player above the average.

CONCLUSIONS

Packing a heap of solid engineering which helps justify its £400 price point, this deck delivers a convincing performance on all counts and deserves firm Recommendation. Both finish and facilities are first rate.

TEST RESULTS

Test resolution (L/R av)	16 bits		
Output level, source impedance	2.24V, 0.98dB, 198ohms		
Effective dynamic range	114dB		
Harmonic distortion Ref 0dB	20Hz	1kHz	20kHz
	-95dB	-95dB	-90dB
	(0.0018%)	(0.0018%)	(0.0032%)
Ref -70dB		-42dB	0.84%
Stereo separation	122dB	132/117dB	91dB
Stereo balance L/R	0.05dB	0.06dB	0.04dB
Frequency response (20Hz to 20kHz)	±0.12dB		
High frequency intermodulation	-97dB (0.0014%)		
Electrical noise (CCIR ARM, 1kHz)	-108dB		
Mechanical noise	very low		
Ultrasonic noise	-125dB		
Error correction	1mm gap		
Shock/vibration resistance	good		
De-emphasis	-0.12dB at 5kHz		
Track finding speed (15, YEDS 2)	2 secs		
White noise overload test	OK		
Size (w x d x h)	43 x 34 x 11.5cms		
Typical price inc VAT	£400		



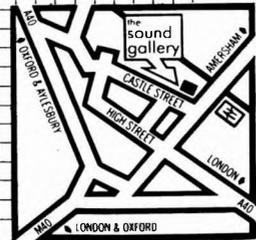
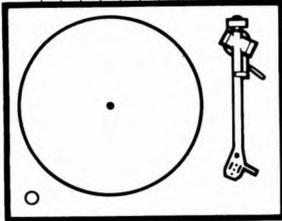
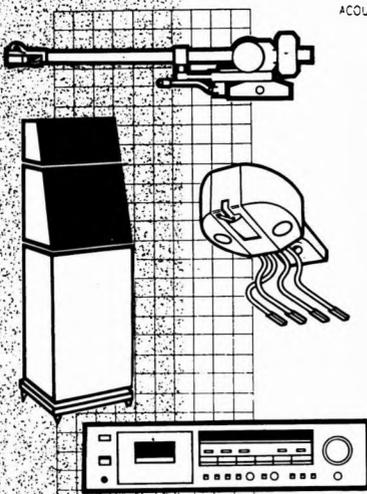
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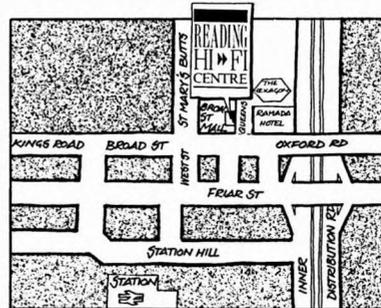
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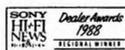


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SONY CDP 338ESD

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES, MIDDLESEX. TEL: (0784) 467000.



Sony's *CDP228ESD* and *CDP338ESD* are sufficiently similar to share the same operating manual and remote control handset. The front panels are also very similar. Pick the two machines up, however, and there's a very obvious difference. The 12.5kg *338* is nearly twice the weight of the *228* – and also draws nearly twice the electrical current for its more elaborate circuitry.

The *338* is fitted with Sony's abbreviated 'custom file' disc menu memory system, a motorised remote volume control, fixed and variable analogue outputs, optical and wired digital outputs, a headphone socket and so on – if you can name it, this machine has got it! There are 20 keys for direct track entry, plus comprehensive programming and repeat modes. Finish is first rate and the deck is solid and mechanically well damped. It operates smoothly, quickly and virtually silently.

LAB REPORT

Like its big X7 brother the *338* uses roughly the same methods of construction but on a rather smaller scale. There are double skin side panels and strengthening steel 'U' sections running from front to back, with cross-bracing for mounting the various boards, transformer and transport. There's a single multi-tapped transformer of reasonable size, and good quality decent size power supply capacitors housed on a separate board, followed by a fair complement of regulators with discrete circuit technology applied where deemed necessary on the main board.

All the control and digital circuitry comes from Sony, including the 45-bit 8x oversampling digital filter which includes de-emphasis in the digital domain. This drives a pair of 18-bit Burr Brown *PCM58P* digital-to-analogue converters. A copper bus bar is used to divide the left and right audio circuits based on *NE5532DD* op-amps.

The display board has its own separate compartment screened from the rest. The remote volume control uses a motor driven potentiometer, the transport a linear tracking linear motor. The clamp arm is fixed, the

decoupled subchassis moving up to meet it. Mechanical damping is extensively applied.

Full level output has been pushed up to 2.46V from a usefully low output impedance of 200ohms. Harmonic distortion is exceptionally good at all levels and frequencies and the intermodulation test results are encouraging. Stereo balance is perfect and stereo separation exceptionally good. Ultrasonic noise is exceedingly well suppressed and the player has a large effective dynamic range. Error correction is respectable though unexceptional. The frequency response shows signs of the bandpass filter coming in slightly early (–0.16dB at 20kHz). Low level linearity is perfect on both channels right down to the noise floor.

SOUND QUALITY

Recalling the success of this model's predecessor, the *337*, the *338* sounds surprisingly different. In some areas there's a notable improvement – the *338* draws strength from the flagship X7 in the treble for example. Orchestral strings and jazz cymbal are rendered with great precision and tonal purity, sweet and airy with good space and depth.

The midrange is also good, but top line scores are kept at bay by two weak points. There's a hint of inconsistency in the delivery of detail and depth, which appeared to vary with musical complexity and loudness. And there is also the bass. Alone, this gives a good impression of articulate clarity but it fails to gell convincingly into the overall scheme of things on more complex material.

Put bluntly, this Sony does not put a rock beat together properly. The bass is not quite in sync with the mid timing, and ultimately the delivery of the older *337* was preferred, despite the evident strengths of the new model in the mid and treble. Having said this, the scores still place the *338* in the 'good' class, assisted by notably solid stereo images.

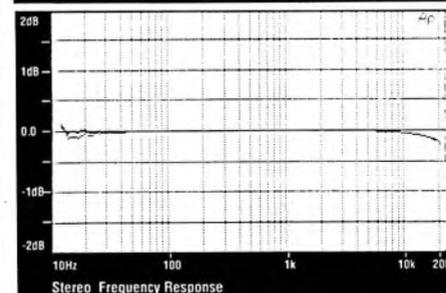
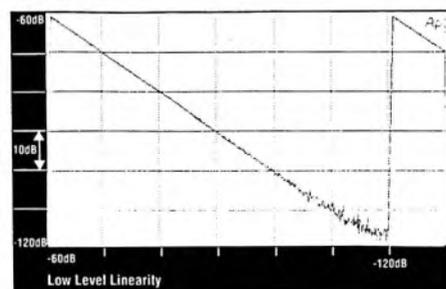
CONCLUSIONS

I was a firm fan of this model's predecessor, and was hoping for a general improvement here, especially as regards bass timing. In the

event this player sounds rather different with a somewhat uneven mixture of subjective strengths and weaknesses. The build quality and facilities are very good, so although formal recommendation is not appropriate, I strongly urge personal audition.

TEST RESULTS

Test resolution (L/R av)	15.9 bits		
Output level, source impedance	2.46V, 1.8dB, 200ohms		
Effective dynamic range	113dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–95dB	–96dB	–91dB
	(0.0018%)	(0.0016%)	(0.0028%)
Ref –70dB		–42dB	0.79%
Stereo separation	140dB	125dB	100dB
Stereo balance L/R	0.01dB	0dB	0.01dB
Frequency response (20Hz to 20kHz)	–0.16dB		
High frequency intermodulation	–97dB (0.0014%)		
Electrical noise (CCIR ARM, 1kHz)	–109dB		
Mechanical noise	very low		
Ultrasonic noise	–127dB		
Error correction	1mm gap		
Shock/vibration resistance	good		
De-emphasis	–0.1dB at 5kHz		
Track finding speed (15, YEDS 2)	2 secs		
White noise overload test	OK		
Size (w x d x h)	43 x 37 x 12.1cms		
Typical price inc VAT	£550		



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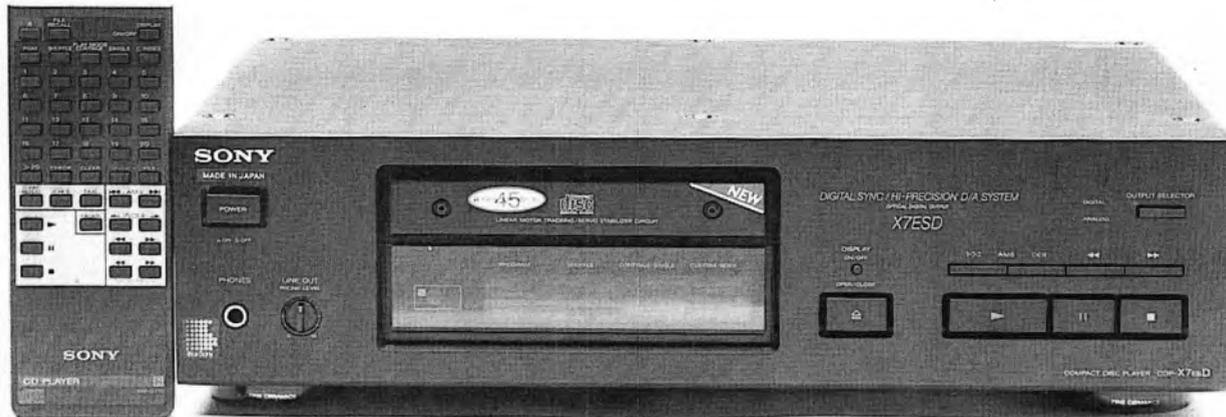


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SONY CDP-X7ESD

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES, MIDDLESEX. TEL: (0784) 467000.



Top of the Sony *ES* line, this £1,300 model follows a new numbering system and introduces a new look for upmarket players, based on a highly simplified front panel carrying only the most basic operating facilities. For example, the *X7* has play, pause, stop as a prime threesome, adjacent to track skip and source. Others comprise 'display', a switch for the digital outputs (both optical and wired), power on and drawer open. A head-phone socket with level control is provided, though unlike with the £400 *CDP 228ESD* model, the latter is neither motorised nor operable from the infra-red remote handset.

With most of the controls transferred to the handset, this 48 button unit looks rather forbidding! The *Custom File* feature is included, and has memory to accommodate a collection of over 220 discs. A 20-key numeric pad aids track number entry, and facilities include the usual 'shuffle' and programmed repeat.

This is another of those players with a confusing '45-bit' label on the front panel. Three sets of analogue outputs are available: one variable (controlled by the front panel volume) and two fixed at 2 volts (balanced XLR and unbalanced phono). Build quality is superb, and this is one of the heaviest single box players ever, weighing in at an astonishing 17kg!

LAB REPORT

Inside the unit, construction is substantial in every way. Copper plated steel girders run from front to back to strengthen the whole assembly and provide mounting for the various printed circuit boards, transformers and CD transport. It was a bit of a surprise to find a 39mF 5.5V capacitor on the digital board, and presumably this is for memory back-up. There are large shielded transformers for both audio and digital, while generous 'Great Supply' capacitors and a plethora of regulators feed voltage to the various circuits.

All the control chips are Sony's own, the new 45-bit 8x oversampling Sony digital filter supplying the data to a pair of Burr Brown

PCM58P 18-bit digital-to-analogue converters. The audio circuitry uses the ubiquitous *NE5534* series op-amps together with some exotic film capacitors. The muted relay output is DC coupled using an op-amp servo loop, although the balanced output is transformer coupled. The transport is one of Sony's very expensive linear motor types (like the *R1*) and the motor driven clamping system is magnetically assisted.

Output level is 2.57dB above the CD standard of 2V, so this player will sound noticeably louder than normal. The harmonic distortion at low frequencies is excellent and is maintained at reduced output levels. Stereo separation is also first rate but channel balance deviated slightly at high frequencies. Error correction is unexceptional, but elsewhere the player measures exceedingly well.

SOUND QUALITY

As with some other Sony machinery in this issue, this one proved problematic in presenting a mixture of virtues and weaknesses. These divided the panel and pointed towards the need for personal, individual audition.

No one disputed that this player has a strong and forceful sound, with clear, firm instrumental lines and excellent detail and differentiation. Conflict arose, however, concerning an otherwise fine treble which seems a little short in focus, while the powerful, tactile and articulate bass demonstrates a lack of rhythmic coherence with the midrange.

Stereo soundstages are solid, yet depth is unexceptional and the reproduced acoustic sounds a touch too dry. The midrange is generally accurate, yet violin tone tends to thinness. Taken overall the sound is a bit 'larger than life' and though elements of a great performance are apparent these unfortunately do not hang together well enough. The final rating is a disappointing average.

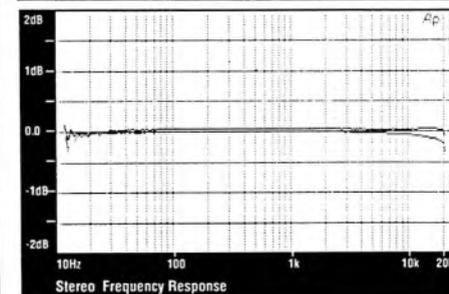
CONCLUSIONS

This new-look one-piece Sony flagship promises much, not the least from its very weighty construction. Build quality is impressive and

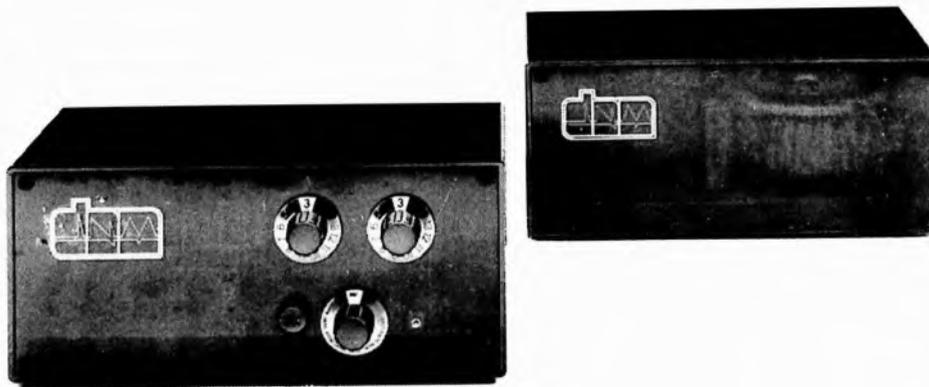
the lab results are superb, but the sound caused us some trouble and generated mixed reactions. Some points were highly rated but others were less liked, so it's worth hearing, but formal recommendation is not appropriate.

TEST RESULTS

Test resolution (L/R av)		16 bits
Output level, source impedance	2.69V, 2.57dB, 200ohms	113dB
Effective dynamic range		113dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	-96dB -96dB -88dB	
	(0.0016%) (0.0016%) (0.004%)	
Ref -70dB	-41dB 0.89%	
Stereo separation	133dB	104dB
Stereo balance L/R	0.04dB 0.04dB	0.17dB
Frequency response (20Hz to 20kHz)		±0.17dB
High frequency intermodulation		-96dB (0.0015%)
Electrical noise (CCIR ARM, 1kHz)		-109dB
Mechanical noise		very low
Ultrasonic noise		-125dB
Error correction		0.75mm gap
Shock/vibration resistance		very good
De-emphasis		-0.1dB at 5kHz
Track finding speed (15, YEDS 2)		2 secs
White noise overload test		OK
Size (w x d x h)		43 x 37 x 12.1cms
Typical price inc VAT		£1,300



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TEAC PD 470LE

TEAC (UK) LTD., 5 MARLIN HOUSE, THE CROXLEY CENTRE, WATFORD, HERTS WD1 8YA. TEL: (0923) 225235.



The Japanese Teac brand is active in both domestic and professional markets. Although most famous for analogue open reel tape recorders and cassette decks the company continues to produce a comprehensive range of hi-fi separates and has long been active in the area of digital sound. The range of CD players is comprehensive, covering the market from the inexpensive right up to a two-box 'super heavyweight'.

This new limited edition Teac PD470LE is the first model from this brand to be 'breathed on' by UK design consultant Stan Curtis. As such, the £280 price is £30 more than the standard version. The latter sounded pleasant but unexciting when assessed by *Choice*, so the aim is clearly to add that little extra something.

Facilities include a remote control handset with a goodly array of buttons, including a ten-key pad for quick track entry. Both standard and 8cm discs can be played, and the unit has one wired coaxial digital output alongside a pair of fixed level audio outputs. Up to 20 tracks may be programmed in any order, and an auto-space feature aids cassette dubbing. This inclusion of a headphone socket is weakened by the absence of any volume control.

The comprehensive display shows track number, index number, timings and a track calendar. Index points can be accessed.

Like many of the current crop of Teac players, the case is plastic with integral back-to-front and longitudinal moulded in bracing. This moulding also contains the basis for the transport, though the laser and direct drive disc motor are mounted on a four-point suspended subchassis and decoupled by undamped springs. The top and bottom panels are of undamped steel, and the whole forms a stiff and resilient construction, sitting on four, gold-banded plastic feet. The front panel is a plastic imitation of an alloy extrusion.

LAB REPORT

This 4x oversampled, dual 16-bit PCM 56P design uses fourth order analogue filtering to

complete the audio chain, and this is where the LE improvements have been made. They include the substitution of a better grade op-amp and the use of selected quality passive components. In other respects the 470LE is a budget design, with no special mechanical damping or attempt at vibration control.

It measures very similar to the standard 470 previously reviewed in the lab, and replay linearity in particular was not a strong point. Performance is degraded below -70dB, where the results are poorer than average. Distortion at low signal levels is higher than usual, but in most other respects the test results are satisfactory. The frequency response shows some treble lift - not normally to be encouraged with CD - while error correction is rated only adequate.

SOUND QUALITY

No doubt about it, this upgraded 470 sounds distinctly better than the standard model we reviewed a few months ago. That one was satisfactory, if unexciting while the new version is somewhat better, if still a little below the group average.

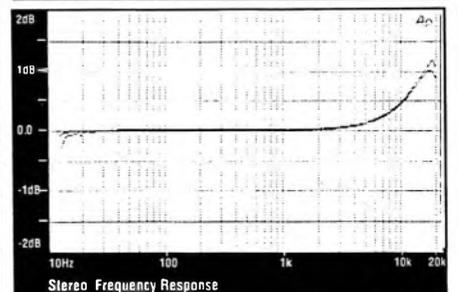
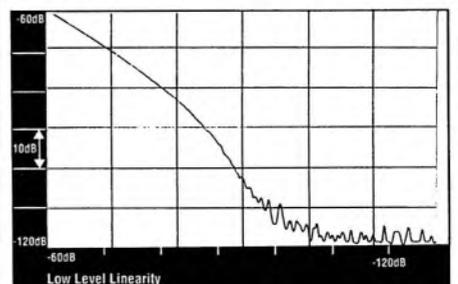
A slight 'zinginess' and brightness characterises a treble range which is clearer and more informative than before. This clarity helps create the impression of respectable stereo depth and stage width and satisfactory image focus. However, perspectives are flatter than those of the best in its class, while although the bass sounds quite tight and boppy, the overall rhythmic performance is unexceptional. Musical dynamics rate average, while the mild brightness could prove fatiguing if used with bright sounding amplifiers or speaker systems.

CONCLUSIONS

The LE upgrade has improved a rather below average player, but only to a position which is still a little below the current group average. The sonic performance is still not sufficient for formal recommendation, while better low level linearity and more generous error correction would both be welcome.

TEST RESULTS

Test resolution (L/R av)	14.5 bits		
Output level, source impedance	2V, 0dB, 980ohms		
Effective dynamic range	95dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-90dB (0.03%)	-88dB (0.04%)	-80dB (0.1%)
Ref -70dB	-26dB	-26dB	5%
Stereo separation	121dB	104dB	77dB
Stereo balance L/R	0dB	0dB	0.1dB
Frequency response (20Hz to 20kHz)	±1dB		
High frequency intermodulation	-87dB (0.03%)		
Electrical noise (CCIR ARM, 1kHz)	-100dB		
Mechanical noise	some		
Ultrasonic noise	-112dB		
Error correction	0.5mm gap		
Shock/vibration resistance	average		
De-emphasis	±0.2dB at 5kHz		
Track finding speed (15, YEDS 2)	4 secs		
White noise overload test	OK		
Size (w x d x h)	43.4 x 28.2 x 8.9cms		
Typical price inc VAT	£279		





ESSENTIAL NUMBERS.

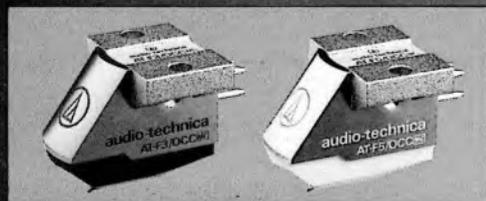
NEW HORIZONS IN ANALOGUE TRANSDUCING

In the constant perfection of record reproduction, Audio Technica unveil their latest numbers . . . AT-OC7 and AT-OC9. Having an almost identical 'on paper' specification, both incorporate varying elements of the newest technology in materials and micro-engineering, many of them developed originally in applications for NASA and the hi-tech aerospace industry. The result is a sound quality previously considered unattainable in the sub £500 category.

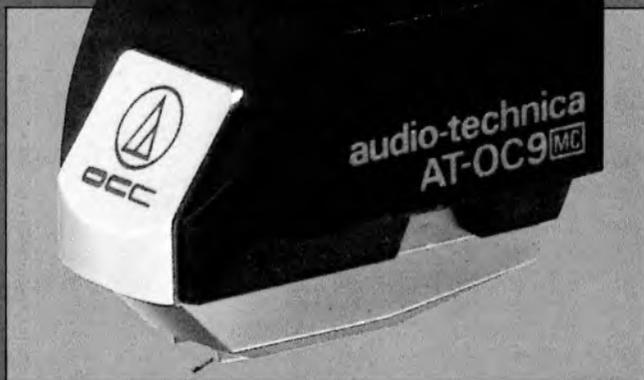
Whilst the list of technical achievements is endless, the true test is in the listening. Press comments include . . . *'the OC7 is a superb sounding cartridge; there's no other way of looking at it. It's treble articulation and dynamics are exceptional'* — NEW HI-FI SOUND. *I will say with certainty that the OC9 is one of the very best cartridges I know, and can give it my strongest and most enthusiastic recommendation'* — HI-FI REVIEW.

Please contact Audio Technica for complete reprints of these together with the reviews of Hi-Fi Answers, Gramophone and Hi-Fi News. Better still, call in for a personal audition at BADA and specialist audio retailers and find out why AT-OC7 and AT-OC9 are now essential numbers in today's top flight analogue systems.

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Weight (gm)	7.8	7.8
Stylus	Square shank elliptical	Square shank elliptical
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BEST BUY



The £160 *SL-P202A* is Technics' least expensive CD player, a factor which is certainly helped by the fact that it is manufactured in Technics' own plant in Hamburg. It uses some Philips technology – notably the control chips and transport – alongside Panasonic's MASH low-bit high-oversampling replay technique.

At this price level not much is given away, this lightweight machine lacking remote control, headphone socket or digital output. However, the (more visible) fluorescent display is a fancy one taken from a more costly player, and includes clear and separate indication of track number, index number and timing, alongside a 20-track calendar. Repeat modes comprise full disc or a pre-programmed selection while up to 20 tracks may be programmed in any order.

Edit modes allow entry of cassette length, and automatically allocate the number of tracks to the recording – the player can even link the timing of tracks from different discs. Search modes include music scan, which plays excerpts of each track to aid identification, plus two speed audible music search and forward or reverse track skip. The audio outputs are at a fixed level only. The build and finish of the *202* are certainly well up to standard, and the economical price has clearly been achieved by omitting the more costly features.

LAB REPORT

The *SL-P202A* uses the latest *CDM4* transport from Philips, which is decoupled on a four spring suspension, has a radial tracking laser and the latest weighted disc clamping system. The control board is also bought in from Philips, but the rest of the circuitry is typically Technics.

A board houses the MASH bitstream converter system, and the majority of chips including the output op-amps are surface mount types. As it's built to a price, there are no audiophile parts as such, but the design is compact and well sorted. A small mains transformer provides the power to the small reservoir capacitors and a minimum of

voltage regulators.

All the latest series of Technics measure almost perfectly, including those using the relatively new MASH pulse width modulation bitstream system. The *202A* is no exception, and one has to be pedantic to complain about such trivial travesties as only 84dB stereo separation at 20kHz or a signal-to-noise ratio of a mere –97dB! The low level linearity is very nearly perfect right down to below –110dB, and harmonic distortion at –70dB modulation is an excellent 0.63 per cent. In fact the only real complaint that can be made is aimed at the accuracy of the de-emphasised response, which shows errors of 0.16dB at 1kHz and 0.26dB at 5kHz, both of which should have been less.

SOUND QUALITY

The new series of MASH players from Technics show great similarity in subjective performance, all achieving a respectable standard. Overall the *202* rates just a little below the group average, which is more than satisfactory for the price.

Despite some mild glare and 'wire' on string tone, the treble is cleaner and better differentiated than usual, as is often the case with budget machinery while the stereo soundstage shows respectable space and ambience. The overall tonal balance is pleasantly musical and this helps to create nicely balanced perspectives.

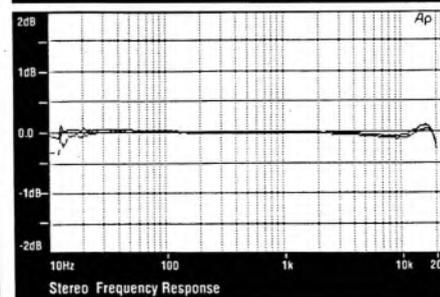
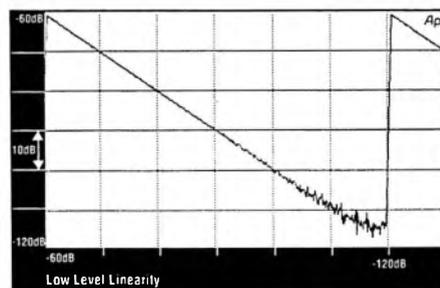
The bass sounds competent enough, with a suspicion of more pace and dynamics than several other Technics players. The *202* is informative and delivers a well balanced, inoffensive performance but ultimately falls a little short of the best of its competition due to a slight lack of excitement.

CONCLUSIONS

Devoid of frills, this MASH technology budget player is built to traditionally high Technics standards and delivers a fine lab performance to boot. The sound quality was most presentable for the price too, so this deck makes a worthy addition to the 'Best Buy' listings.

TEST RESULTS

Test resolution (L/R av)	15.8 bits		
Output level, source impedance	2.15V, 0.63dB, 780ohms		
Effective dynamic range	104dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	–86dB (0.005%)	–92dB (0.003%)	–90dB (0.003%)
Ref –70dB	–44dB	0.63%	
Stereo separation	111dB	111dB	84dB
Stereo balance L/R	0.02dB	0dB	0.01dB
Frequency response (20Hz to 20kHz)	±0.27dB		
High frequency intermodulation	–104dB (0.0006%)		
Electrical noise (CCIR ARM, 1kHz)	–97dB		
Mechanical noise	low		
Ultrasonic noise	–104dB		
Error correction	2.4mm gap		
Shock/vibration resistance	acceptable		
De-emphasis	±0.26dB at 5kHz		
Track finding speed (15, YEDS 2)	3 secs		
White noise overload test	OK		
Size (w x d x h)	43 x 27.5 x 9cms		
Typical price inc VAT	£160		



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Technics players tend to look more substantial with each succeeding generation, and this £250 example is no exception. The appearance is dominated by a large control knob which engages variable speed forward and reverse cueing with audible music search. This may be used alongside versatile cassette dubbing edit facilities which include a time mode to help fit cassette lengths and sort out the division of sides A and B.

Covering the basics, this is a full width machine equipped with a full feature remote control. There's a headphone socket with its own level control, while digital output is available in optical form only. A single pair of audio outputs are fed via a remote digital mode volume control facility which covers only a limited 12dB range in only a few steps.

Up to 20 tracks may be programmed in any order, the selection displayed on the music calendar. Other play modes include random or shuffle, timer controlled and repeat – single or A to B phase. Ten keys provide rapid track entry on both player and handset. The unit is nicely built, operates smoothly and proves easy to use with its clear display. As the technical section reveals, the 4x 18-bit fascia description is misleading. This is in fact a 64x oversampling, single DAC MASH (low-bit) design.

LAB REPORT

There are many similarities between this player and the *SL-P555* also reviewed this month. The differences between the two are fairly limited and are generally manifest in component rather than design changes. A small transformer supplies current to the main board via ribbon cable, where adequate reservoir capacitors supply enough regulators to do the job in hand. Many surface-mount chips are used on the main printed circuit board, which is connected via plugs to the front-mounted display and switching board.

The design is elegantly simple, very well thought out and thoroughly sorted. The MASH bitstream system of digital-to-analogue conversion is used. All parts are of

standard commercial grades, with nothing particularly 'audiophile' present, though the use of a linear tracking transport is something of a bonus at the price. This uses a well decoupled subchassis and a magnetic disc clamp which is designed to spin free of the mineral loaded plastic clamp arm when a disc is playing.

Total harmonic distortion results are fairly representative of a typical CD player, but the IM results are excellent. The CCIR ARM 1kHz weighted signal-to-noise ratio and the ultrasonic noise residual are representative of the MASH technology – multi-bit systems tend to perform rather better here. But whereas we have come to expect exemplary low level linearity results from this bitstream approach, this player proved to be the exception to the rule; errors of around 5dB can be seen below the –90dB level. The frequency response plot reveals a slight bump between 10 and 20kHz, plus some channel imbalance which doesn't show up on the spot frequency checks.

SOUND QUALITY

First impressions were of an even tempered, well balanced sound with good consistency over the frequency range, on both complex and simple arrangements, and throughout the entire dynamic range. Nothing stood out as either exceptionally good or bad, the final overall rating falling a little below average.

It is pleasant throughout the midrange, sounds a little soft in the bass, while the treble has above average sweetness. But, ultimately this player does not sound very interesting. There is an overall impression of dryness, plus a lack of sufficient ambience and speed. More air and sparkle are required to wake up this laid back performer!

Stereo stage width and focus are very satisfactory, but the *333* lacks substantial depth and both rhythmic drive and dynamics are muted. Bass timing is rather average.

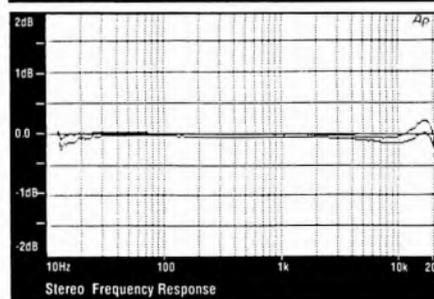
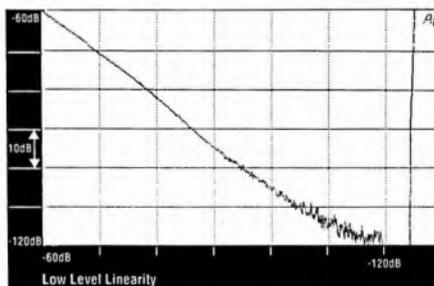
CONCLUSIONS

While this player sounds generally pleasant and inoffensive, it also lacks that necessary

drive and feeling of communication that is necessary to convince the listeners. On facilities and lab performance it is difficult to fault, and the engineering rating was also a good one, so it misses recommendation by just a small margin.

TEST RESULTS

Test resolution (L/R av)		15.2 bits
Output level, source impedance	1.96V, –0.02dB, 760ohms	
Effective dynamic range		110dB
Harmonic distortion	20Hz 1kHz 20kHz	
Ref 0dB	–82dB –87dB –92dB	
	(0.008%) (0.005%) (0.003%)	
Ref –70dB	–43dB 0.79%	
Stereo separation	103dB 101dB 82dB	
Stereo balance L/R	0.03dB 0.03dB 0.17dB	
Frequency response (20Hz to 20kHz)		±0.2dB
High frequency intermodulation		–104dB (0.006%)
Electrical noise (CCIR ARM, 1kHz)		–96dB
Mechanical noise		low
Ultrasonic noise		–104dB
Error correction		2.4mm gap
Shock/vibration resistance		good
De-emphasis		+0.08dB at 5kHz
Track finding speed (15, YEOS 2)		2 secs
White noise overload test		OK
Size (w x d x h)		43 x 28 x 9.1cms
Typical price inc VAT		£250



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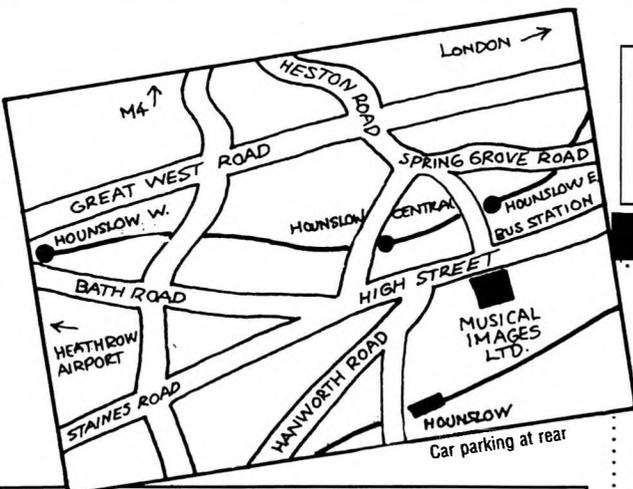
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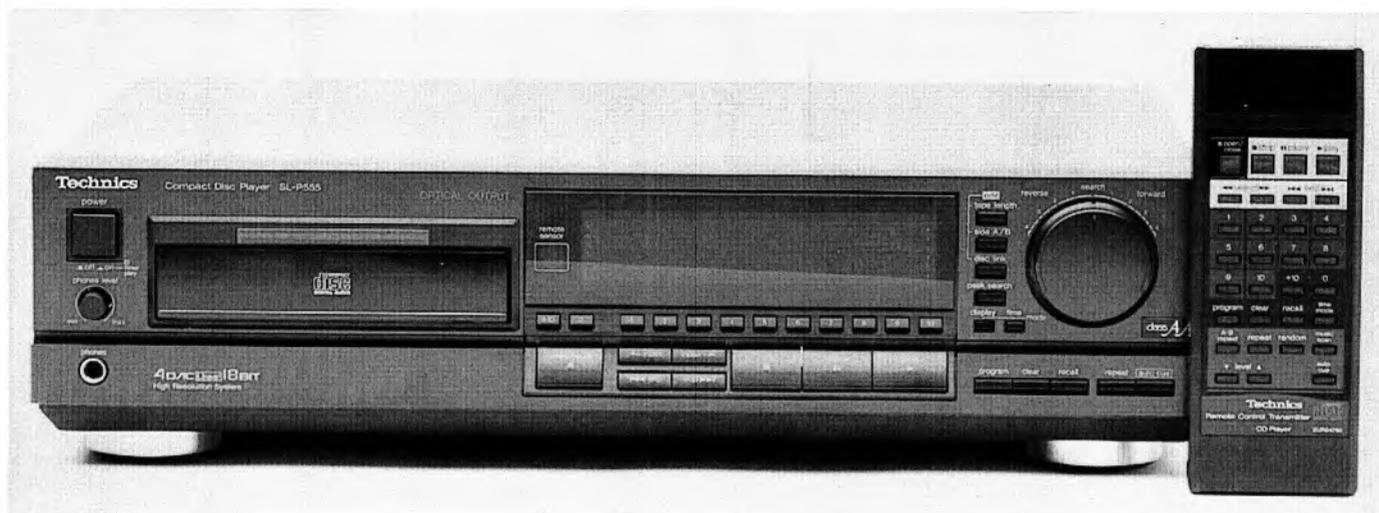
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RECOMMENDED



With quite a large number of Technics players in this issue, in truth it is sometimes hard to distinguish between certain of them – the £250 *SL-P333* and the £300 *SL-P555*, for example. There is a price difference of course, and presumably some sonic advantage – in favour of this more expensive model's 'class AA' line-out circuitry, and there are (very) minor differences in the feature count, but one can't help feeling that some of these models are makeweights to 'complete' the range.

Described as 4x 18-bit, this is another of the Technics MASH players that uses the company's own 'bitstream' technology. One minor feature which distinguishes *555* from *333* is the ability to find and display the loudest peak level section on a disc, and then repeatedly cycle through that point to aid setting the record level meters on a cassette deck. All the usual facilities are present including an elaborate display, and the comprehensive remote control has a 12dB range digital remote volume control. Outputs comprise a front panel headphone socket with associated level control, a solitary stereo audio phono pair and an optical link for digital audio data.

LAB REPORT

First, the *555* deserves some praise for having one of the neatest interiors on the market. The main printed circuit board is long and thin, running the full depth of the player but leaving a large expanse of nothingness to its right. As this board plugs into the one behind the display there's a bare minimum of internal wiring, which is all short runs of ribbon cable. Surface-mounted chips are used almost exclusively and construction is typical of the new generation of MASH bitstream players.

From the very small (but adequate) transformer to the resistors and capacitors, all parts are standard commercial quality, apart from a couple of Elna Cerafine coupling caps. The laser transport uses a mineral loaded plastic clamp arm. The linear tracking laser motor is decoupled from the plastic chassis

on compliant springs. The disc clamp is magnetically connected to the motor table and disengages itself from the clamp arm to improve resistance to external vibration.

This D/A conversion system offers very fine linearity indeed, the low level linearity curve fading smoothly into the noise floor. On the other hand, the frequency response shows some anomalies at high frequencies, and there is error too in the de-emphasis circuits. Error correction is very good, and this player is also insensitive to shock and vibration. Bitstream players do not filter out ultrasonic noise as well as multi-bit players, but the effective dynamic range is similar, even though the measured signal-to-noise ratio is only 97dB. Stereo separation fades a bit at high frequencies, and is not as good as many rivals, but I'm not about to start complaining too much over 74dB at 20kHz.

SOUND QUALITY

This middle-of-the-range Technics scored a perfect average in the panel tests. Highly neutral sounding, it delivers exactly what many hi-fi purchasers are looking for – a consistently competent, neutral and even-tempered performance.

Stereo sound stages are portrayed with very good focus; depth is about average and stage width is fine, though a mild shortfall in ambience and transparency was also noted. Treble reproduction is a strong point – clean and sweet, lacking fatiguing artefacts and with a very presentable level of instrumental detail.

The *555* is tidy in the bass too, with good low frequency weight and extension, though the sense of slam and dynamic quality is less well portrayed. Taken overall, musical dynamics are a little muted, lending a bland cast, while musical pace and rhythmic qualities are about average.

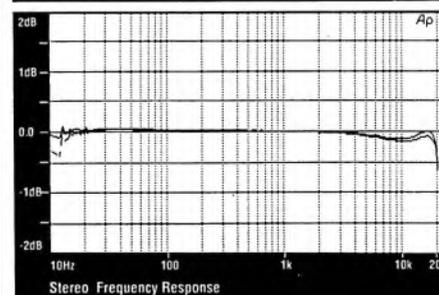
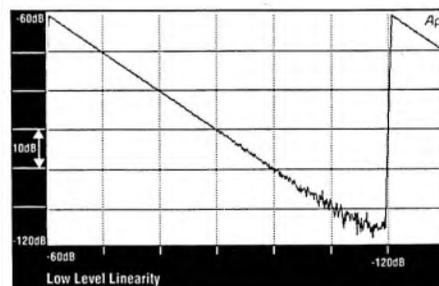
CONCLUSIONS

Technics has successfully found the formula whereby good engineering, plentiful facilities and an impressively built fascia can be combined with a decent standard of sound

quality at a competitive price. This is a good value machine which deserves firm *Choice* Recommendation at its current price.

TEST RESULTS

Test resolution (L/R av)	15.9 bits
Output level, source impedance	2.27V, 1.1dB, 750ohms
Effective dynamic range	112dB
Harmonic distortion	20Hz 1kHz 20kHz
Ref 0dB	-92dB -92dB -91dB
	(0.0025%) (0.0025%) (0.0028%)
Ref -70dB	-43dB 0.7%
Stereo separation	110dB 97dB 74dB
Stereo balance L/R	0.02dB 0.04dB 0.06dB
Frequency response (20Hz to 20kHz)	±0.25dB
High frequency intermodulation	-100dB (0.001%)
Electrical noise (CCIR ARM, 1kHz)	-97dB
Mechanical noise	very low
Ultrasonic noise	-104dB
Error correction	2.4mm gap
Shock/vibration resistance	good
De-emphasis	+0.26dB at 5kHz
Track finding speed (15, YEDS 2)	1.5 secs
White noise overload test	OK
Size (w x d x h)	43 x 34 x 11.5cms
Typical price inc VAT	£300



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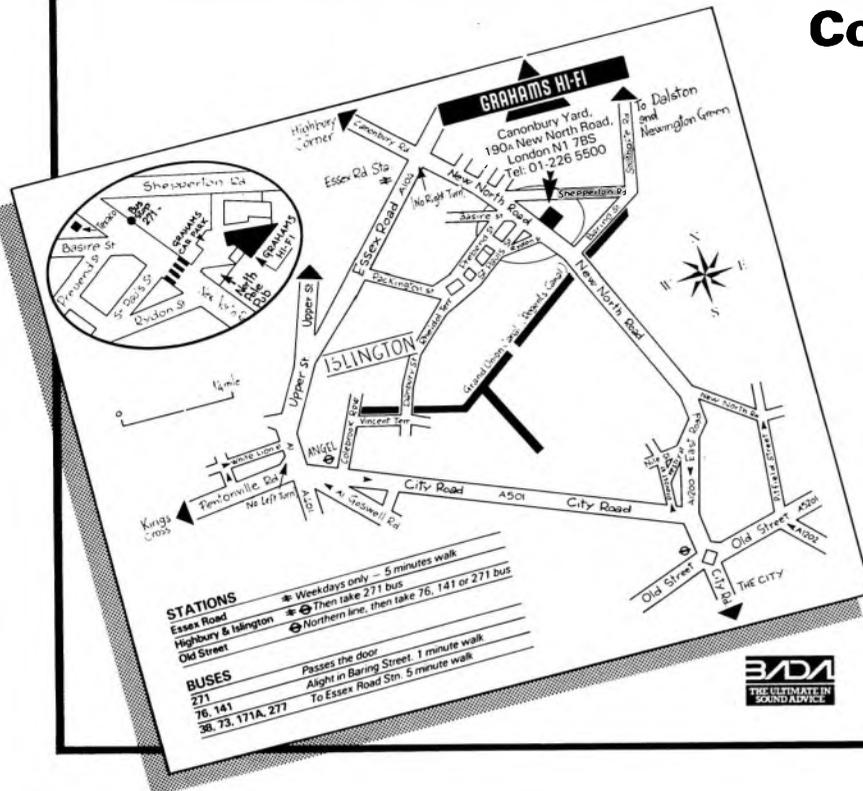
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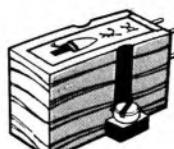
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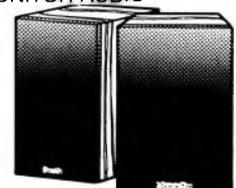
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Another member of the new Technics series, the £350 *SL-P777* shows a significant increase in bulk and facilities compared to the *SL-P555*. The front panel layout is impressive, with clearer graphics than most, while its full 20-key track entry array is supplemented by '+10' and '0' keys; this is duplicated on the remote control handset.

Other features include a front panel switch for the digital (optical only) output, and a facility to switch off the display from the handset. If a function key is then pressed this will momentarily illuminate to confirm the function. This feature is more than just a gimmick; in high resolution hi-fi systems a small improvement in sound quality can be heard when a CD player's display is disarmed.

The display can also act as a recording level monitor by showing peak levels on both left and right channel.

Up to 32 tracks can be programmed in any order, and this well built deck incorporates all conceivable features, including the latest cassette dubbing aids, an eight-position rotary shuttle search control, plus a headphone socket with level control.

LAB REPORT

This fairly upmarket machine sports one of Technics' beautiful linear motor laser transports, well decoupled from vibration and used with a magnetic disc clamp. The printed circuit board looks simple because the MASH bitstream converter system, a 64 times oversampling low-bit design, uses mainly surface-mounted chips and very small resistors.

On the topside, some good quality Nichicon green and selected Elna capacitors are used in coupling and decoupling applications. Output muting is by relay. The power supply uses only small transformer and supply capacitors, with an average regulator count. The top panel is damped to prevent excess vibration upsetting the player, and the execution of the whole is characteristic of Technics - very neat and well ordered, with good quality construction.

The output level of 2.47 volts is 1.86dB up on the standard, sufficient to upset attempts to make A/B comparisons between different models. For reasons unknown, harmonic distortion at 20Hz is slightly worse than equivalent 18- and 20-bit machines, but at higher frequencies there is little to choose between the two systems.

There's some stereo separation asymmetry at low frequencies, and stereo balance is also a bit out. Error correction is pretty good and the shock and vibration resistance is also fine. Elsewhere there is little to attract attention, and as is usual with Technics bit-stream players, low level linearity is perfect all the way down to the noise floor.

SOUND QUALITY

We expected rather more from this new and fairly upmarket Technics player. Rated a straight average overall on sonic merit, the overall impression was one of polite competence that was ultimately criticised for blandness.

Smooth and pleasant, the *SL-P777* delivers good stereo focus, fine stage width and a reasonably spacious ambience with a rich acoustic on classical recordings. However reproduction of stereo depth in the absolute sense is evidently restrained.

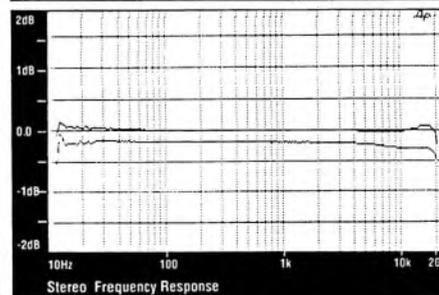
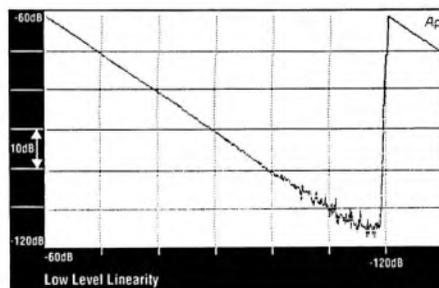
The bass is adequately tidy, the treble fairly clear - slightly glazed but not offensive - while the whole effect is slightly 'airless'. In its favour the '777 provides a more coherent rendition of bass rhythms and timing than many other players, and this helped to compensate for the softened resolution of musical dynamics and bass 'slam'.

CONCLUSIONS

Seen as a luxury version of the '555, the '777 does not seem to offer sufficient improvement on any front to justify the extra £50 involved. It is, however, every bit as good as the '555, so only the extra cost prevents recommendation, and some users might regard the extra features sufficiently important to pay a bit more.

TEST RESULTS

Test resolution (L/R av)	15.8 bits		
Output level, source impedance	2.47V, 1.86dB, 430ohms		
Effective dynamic range	113dB		
Harmonic distortion	20Hz	1kHz	20kHz
Ref 0dB	-88dB	-92dB	-93dB
	(0.004%)	(0.003%)	(0.002%)
Ref -70dB		-41dB	0.89%
Stereo separation	105/113dB	106/114dB	85dB
Stereo balance L/R	0.18dB	0.2dB	0.35dB
Frequency response (20Hz to 20kHz)	±0.1dB		
High frequency intermodulation	-92dB (0.003%)		
Electrical noise (CCIR ARM, 1kHz)	-108dB		
Mechanical noise	low		
Ultrasonic noise	-102dB		
Error correction	2.5mm gap		
Shock/vibration resistance	very good		
De-emphasis	-0.05dB at 5kHz		
Track finding speed (15, YEDS 2)	1 secs		
White noise overload test	OK		
Size (w x d x h)	43.1 x 34 x 12.6cms		
Typical price inc VAT	£350		





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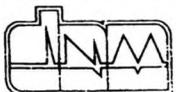
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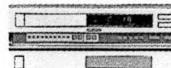
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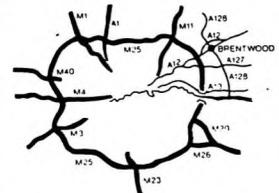
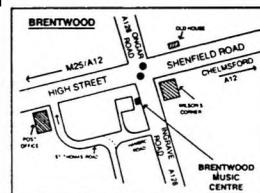
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TECH TALK

Our test programme included complete laboratory analysis as well as thorough auditioning of each player. Here we explain the review approach and test methods.

The sound quality of top of the range black disc players remains beyond question, but CD players are winning more and more sales from analogue.

The general consensus seems to be that CD provides a reliably good baseline of audio quality, which is more than satisfactory for the majority of non-enthusiast applications. Given this baseline the more critical listener can discern significant and important differences in CD player sound quality. In context, a CD player can be auditioned much as one investigates an audio preamplifier; indeed many of the subjective effects may be described in amplifier sound parlance.

The advantages which are indisputably offered by compact disc players over vinyl disc playing equipment can be summed up as follows:

- 1) Up to 1 hour 15 minutes uninterrupted playing time.
- 2) Freedom from surface noise, clicks and pops.
- 3) Discs are comparatively damage and wear-proof (provided some care is taken).
- 4) No complications of stylus wear, contamination or alignment.
- 5) Full automatic facilities, track programming etc, many players having comprehensive remote control.
- 6) All the usual 'cheap turntable' problems such as pitch stability, wow and flutter etc, are absent.
- 7) CD players can be small.
- 8) High level 'flat response' output can obviate the pre-amplifier, and many players also have competent headphone outputs.
- 9) High lab specifications for distortion, balance, separation and signal-to-noise ratio.
- 10) Some immunity to acoustic feedback and reasonable levels of shock and vibration resistance.
- 11) The sound is relatively neutral, with a wide open frequency characteristic as

well as notably good bass, since arm/cartridge subsonic resonances are avoided. Stereo is usually very stable and well focused, with much separate detail.

That said, there remain enthusiasts who continue to prefer their music from vinyl LP sources, complaining of a slightly 'amusical' quality about the sound of CD. The enormous new and secondhand repertoire and lower disc prices remain further major vinyl incentives.

As regards the more subtle aspects of sound reproduction, CD players can vary in their stereo presentation – some have a more relaxed 'distanced' perspective while others seem more direct and 'up-front'. Differences can be found in the far space or depth region behind the frontal image plane, while some players may also show a softening of definition in the bass or treble extremes. The treble may also appear a touch 'grainy' and fatiguing. The mid can vary in tonal quality, with a thinner, 'harder' effect on some players, and a sweeter, more natural balance on others.

LABORATORY TESTS

The format for the presentation of the CD test programme was first introduced in issue 64 last November, replacing the existing version which had been used for some years.

A new technical test was used on all the players in this month's crop. The *CBS 1* test disc contains a fade to noise track for exploring the low level linearity of CD players. This is a dithered 500Hz signal starting at -60dB and over a 30 second period it fades linearly to -120dB. Using the computer controlled Audio Precision System One test set with a very wide dynamic range, it is possible to track this tone down to the noise floor of the CD player. Any linearity error is easily assessed and, although the graphs produced by this method have not been published, comments as to the strength of the players in this department have been made in the reviews

where appropriate.

The frequency response test runs over a test range of 10Hz to 20kHz and an intermodulation graph was taken (but not published) on a logarithmic frequency scale from 500Hz to 25.5kHz, to reveal the audible band distortion products and also the presence of nearby higher frequency components.

The measurements include a readout of the -90dB recovered sinewave, achieved by triggered time averaging. The encode signal is dithered (from CBS disc CD1) which means that any deviations from a pure sinewave are very much the responsibility of the players. Also measured was a spectrum analysis of that signal clearly showing both the distortion harmonics present and the audible noise floor.



The Celestion SL700 used in the listening tests.

The test results tables include a figure for effective dynamic range, the amplitude window available from MSB peak or a nominal 2 volts down to the practical noise and distortion floor. Distortion results are given in dB and percentage to aid comparison with other tests and specifications, and player resolution is expressed directly in bits, this estimated from a

combination of low level distortion and linearity and the accuracy of level recovery from -70 to -100dB recorded modulation at 1kHz.

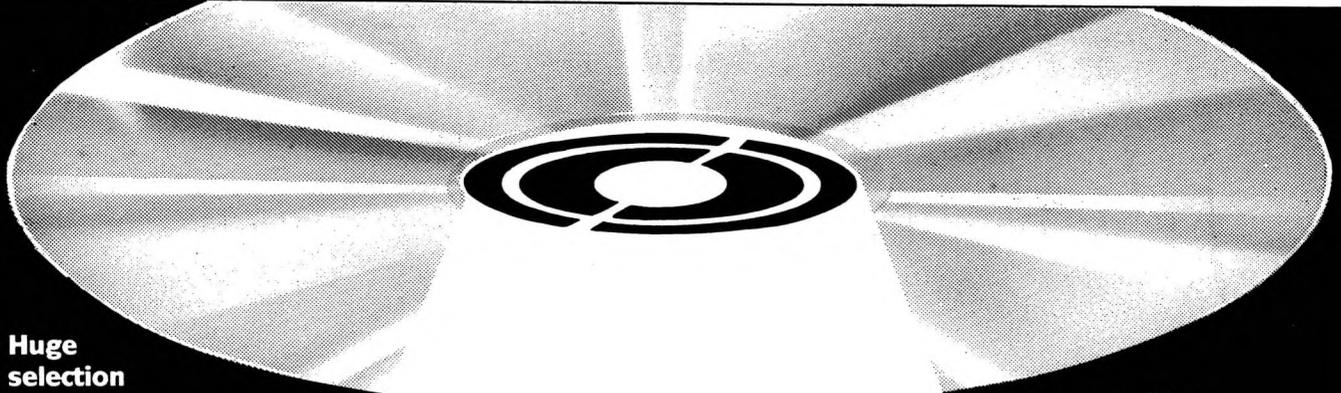
The standard surface gap error test has been expanded from the previous maximum of 0.8mm up to 4mm, and while most players do pretty well these days, with error protection for 0.8 to 1.2mm of data gap loss, a few examples are still quite amazing, with enough processing power to stay audibly clean on up to 3mm of missing data – a huge chunk in context of the very high density of data storage on the disc.

For frequency response, a high resolution graph has been used. Left and right channels are both assessed to ensure that no balance errors occur. Other tests include checking for correct de-emphasis; testing response alignment; output impedance (important when using passive control units); output level; track location speed (assessed as the time taken to access track 15 on the Sony test disc YEDS2). Weighted and unweighted signal-to-noise ratios were measured with and without pre-emphasis and each player's mechanical noise was also assessed.

LISTENING TESTS

After a reasonable conditioning/warm-up period, each player was auditioned by a small group of experienced listeners using a wide range of source material, paying particular attention to establish consistency of rating against previous reviews.

The basic reference system included bi-wired Celestion *SL700* loudspeakers on Celestion stands and Spendor *SP2/2s*, driven by a variety of exotic cables from Musical Fidelity *MA100* power amplifiers, fed from a high quality passive volume control. Reference was made to vinyl reproduction from a Linn *Sondek* with Ekos arm and a van den Hul *MCTwo* cartridge. The software used ranged from early choral music with solo voice, through chamber music, full orchestral pieces to a selection of jazz, rock, and pop.



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CD PLAYERS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Martin Colloms sums up this month's group of compact disc players with a round-up of the recommended models.

As this issue was nearing completion, the Philips publicity machine was getting into gear on the subject of its new 'bitstream' technology, which is soon to be applied to certain new generation models due for release in the autumn season. Hitherto advance details are known of one model, a *CD840* which will be comprehensively equipped and aimed at the middle price sector.

Technics has had a rough equivalent to bitstream for nearly two years now in a decoding system known as MASH, but so far the company has made very little noise about it. Three Technics models in this report use this low-bit, high oversampled decoder system.

So far none of these machines, including a very early *CD840* prototype, have shown a spectacular advance over standard multi-bit technology, so I would currently advise a degree of caution against the overselling of bitstream technology which has been emanating from some quarters. It is important to wait for properly researched reviews of full production models before jumping to conclusions about any new 'wonder technology'.

In this issue, we have players with 14-, 16-, 18- and 20-bit DACs (and also the 2/4-bit pseudo-bitstream examples designed by Sanyo and NTT-Matsushita). We have digital filters of 2, 4 and 8x sampling (64x for MASH) with internal word lengths of 16, 18, 24, 32 and 45 'bits'. Beware of these numbers and the technical claims associated with them; judge only by the results!

To date there has been little correlation between the claims, the numbers and the review performance. Bitstream systems look very interesting, and preliminary results suggest that the potential for superior CD sound is present, but real working players will constitute the proof.

For this latest issue many manufacturers have offered both price reductions and feature enrichment, though many of the latter will I am sure never be

used. There is a distinct problem that many CD players are becoming unnecessarily complicated, so several high end designers are showing a deliberate aversion to the multi-button approach, offering simpler operating controls instead.

However, for many major brands the present evidence indicates that there has not been a significant improvement in sound quality this year. Where this has been the case the difference is obvious – for example, the Rotel and Arcam machines.

It will be worth keeping an eye on the prices of Japanese built and other imported players over the coming months as some machines now suffer the impact of EEC levy adjustments. Our quoted prices are as accurate as possible at press date, but may be subject to subsequent revision.

BEST BUYS

Any given edition of *Choice: CD players* must take into account previous projects and earlier high performing models, which must not be forgotten or omitted

from the final summing up.

This latest group test has thrown up some outstanding performers. One outright Best Buy is the **Rotel RCD855** (£250) – the perfect partner for its successful *BX* series of budget amplifiers.

In the lower price group, **Technics** also scores a Best Buy with its European-made **SLP202** (£160). Stripped of any spurious facilities, this machine performed well on test and is a worthy alternative to the existing competition.

Another equivalent performer at the budget end is the Best Buy **Philips CD610** (£160) which includes a remote control facility.

RECOMMENDATIONS

With its *Mk 2* upgrade in performance, the **Arcam Black Box 2** outboard decoder deserves special mention here. In combination with any decent output (from a Philips/Marantz player with a digital output for example) this machine provides a top notch sound for an outlay of £300. Hard it may be to believe, such a combination would actually be the best player in the

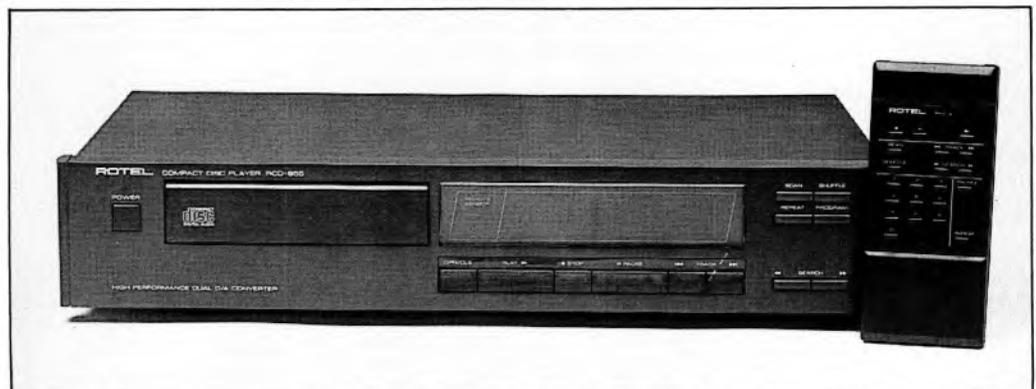
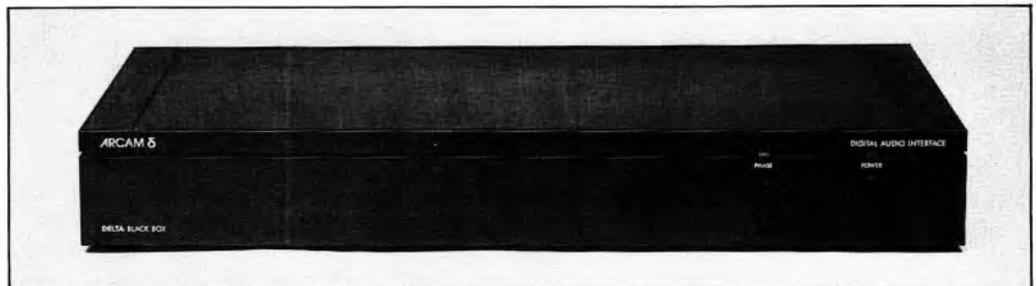
issue – and indeed the best player *Choice* has reviewed to date, apart from the latest Meridian *CD207 Pro*.

Under £300 we recommend the new **Technics SLP55** (£299) and the **Denon DCD 820** (£250), while the **Aiwa XC005** (£280) also deserves a mention for its particularly impressive feature line-up.

In the autochanger group, the £350 **Pioneer PDM710** is one of the better examples of its kind, and is also probably the best sounding. At a more modest (£220) price the **Goodmans GCD 555** works well enough.

Hard to classify, the CD Video player from **Philips**, the £350 **CDV 185**, sounds good enough with CDs and also looks good enough value on video grounds.

In the upper price range there are two quality performers which deserve recommendation, namely the **Arcam Delta 70.2** (£550) and the **Sony CDP228ESD** (£399), the latter particularly well equipped and finished. For existing Best Buy and Recommended models from previous issues see the *Directory* for details.



Top: Arcam's Black Box Mk 2 provides a top notch sound for an outlay of £300; and above, the outright Best Buy – Rotel's £250 RCD855.

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The RSTR355 Cassette Deck has Dolby B and C, but also boasts Dolby HX-Pro which allows an ordinary cassette tape

to have the recording performance of a metal tape. It also has a twin cassette deck for easier tape duplication and auto reverse for ease of operation.

For those that appreciate the digital quality of CD meanwhile, the SLP333 Compact Disc player is a must. It has Technics Class AA circuitry for better recovery of analogue recorded music as well as superior speed of track access with programmable play.

The radio has also come a long way since 1972, to the point that it's now called



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RSTR355 CASSETTE DECK £199.99

a tuner. The STG560 features rotary encode tuning, 39 channel random access presets, autoscans and auto memory. In fact it's so good, it even makes Radio 1 sound wonderful.

And to amplify all that, the SUV560 is in a league of its own. Class AA circuitry guarantees faithful delivery of sound quality to 65 Watts (RMS). It also has extensive aluminium screening of phono and line

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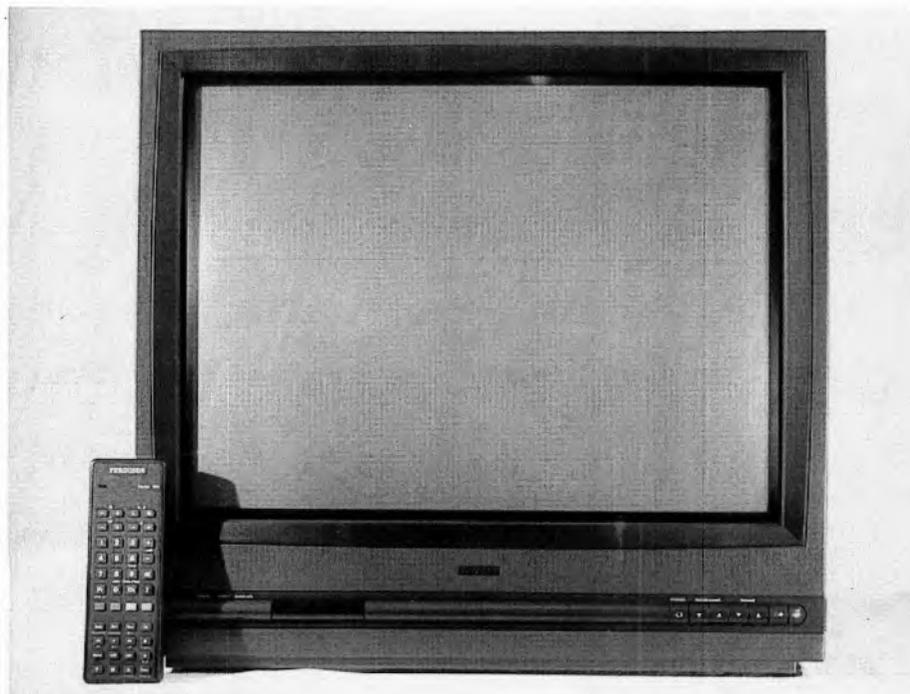
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RECOMMENDED



Helped by a solid rental base, Ferguson has long been UK brand leader in both CTVs and VCRs. Two years ago the brand was acquired by French multinational Thomson, and the technology transfer seems to be helping it revitalise a rather stodgy image. Despite costing less than most, the £599 monitor-style 59K5Q looks very much a trendsetter amongst the models assembled here, with a number of unusual features that help set it apart.

Most obvious is the screen/tube. Known as a *Super Planar* and made by Thomson's Italian tube subsidiary Videocolour, it is claimed to be the first 'aspherical' CPT in mass production. It's perceptibly squarer than the others, and also flatter in some ways – the horizontal plane is almost completely flat across the central half, though the vertical plane is more conventionally curved, and a downside of the flat centre is tightening curvature at the edges. This variable curvature would create off room reflections when the set is turned off, so a matt coating is also applied.

Sideways-facing stereo speakers are tucked away at the back – sitting across a reflective corner could help (while the optional 59K57 Ferguson extension speakers would help even more.) Frontal area is a bit larger than some, but the picture frame is quite shallow and the rear cover quite compact. Though perhaps a little too 'plastic' for some tastes, the whole thing looks properly designed, the various shades of grey making a welcome change from black on black. Just the right number of essential controls and status indicators are built into a single elegant contrasting strip – with real English legends instead of Euroglyphics.

Interface socketry is sufficient rather than

ample. Headphones plug in the front and extension speakers into rear DINs. A solitary SCART uses a clever software trick to double as a Y/C component (S-VHS) input. And a pair of phono sockets provide fixed level audio output, so you can feed NICAM sound into the hi-fi without difficulty.

The manual is a model of clarity, not to mention English, if a bit of a tome. A full list of transmitter/channel numbers facilitates the tuning process – itself very easy to do, but not without reference to the manual. The control microprocessor might be a little complex for some tastes – there's even a 'parent lock' capability which disables the set until your teenage son cracks the code because you lost/forgot the PIN number. But a major strength is its excellent on-screen two-colour graphics, with clear scale-and-pointer displays, and the operational logic is refreshingly logical.

The handset is a little less inspired, 40 or so identical and occasionally sticky black buttons are enlivened only by the Fastext quartet. Still, at least the buttons are large and far enough apart, and most of the labels are clearly legible. A shift-key accessing less essential commands has kept the button count in bounds whilst incorporating extensive (Ferguson) VCR and Text operations.

PICTURE AND SOUND QUALITY

Both geometry and nonreflective coating influence picture quality significantly, and to my eyes almost entirely favourably. The screen shape takes a little getting used to – it certainly disconcerted one of my more experienced consultants – and still shows occasional oddities with captions and panning. But it's nice off-axis and most of the time – even on snooker, rather to my surprise

– which is all that can be expected in an imperfect world.

The matt surface doesn't stop the screen from reflecting ambient light of course – probably slightly the reverse in fact – but it does inhibit the construction of specific images. Sunlit windows or bright local lighting tends to raise the black level a bit, but doesn't tend to obliterate the white level with sharply defined reflections, merely spreading the unwanted effect in a more amorphous and less obtrusive way.

Basic picture quality in terms of resolution and convergence is amongst the best, though slight overshoot may be one reason it isn't the cleanest or tidiest. Colour balance varies slightly from the group norm, leaning away from blue and towards yellow and green. The tube is bright enough, but only just – I found myself working right at the top end of the available contrast range.

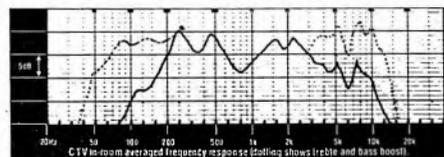
The line-out audio from the TV tuner and NICAM decoder is respectable enough, but the inbuilt speakers aren't up to much, though they're not quite the worst. Full bass and treble boost actually gives an almost tolerable balance (see graph), but there's a serious lack of welly. And the box goes off at various frequencies up to 250Hz. The extension speakers avoid this last problem at least, whilst also smoothing the mid and treble and permitting a sensible stereo spread. But they're not too clever by hi-fi standards, are too strong from 150-300Hz, with not much going on below.

CONCLUSIONS

The 59K5 is a trendsetting and attractive monitor design, if a bit lightweight and plastic in build and sound. The faceplate shape and colour balance are a little different, but picture quality is good and a tolerable NICAM output is available to feed a hi-fi system. Since it's also one of the cheapest Recommendation is appropriate, but only really for monitor applications as the on-board amplifier and loudspeakers are pretty gutless.

GENERAL DATA

Size (max. w x h x d)	56.3 x 54.3 x 41 cms
Screen size (diagonal)	23.5 ins/59.5 cms
Screen convexity (horiz. x vert.)	2 x 1.9 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext
Stereo audio output	Yes
SCART	1
S-VHS (Y/C component)	via SCART
Headphones	Yes
Price	£599



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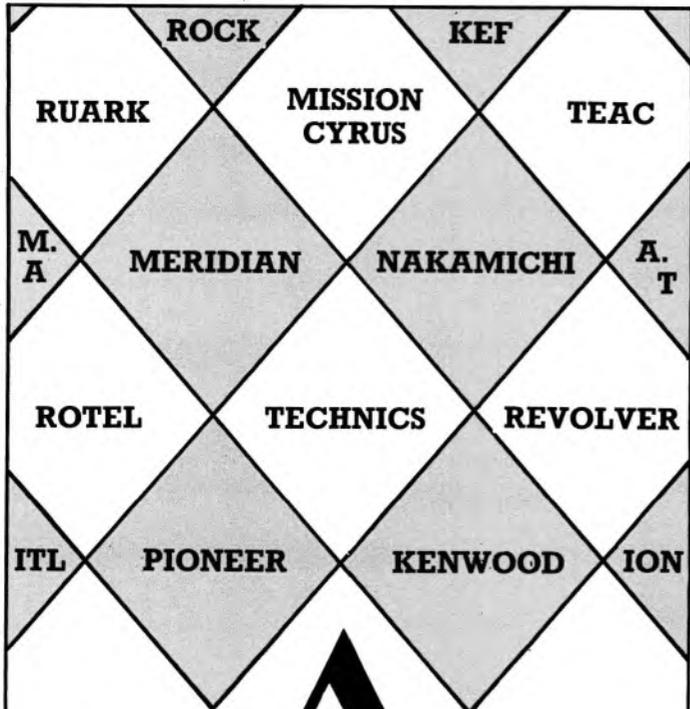
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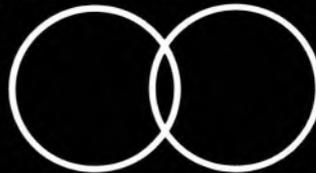


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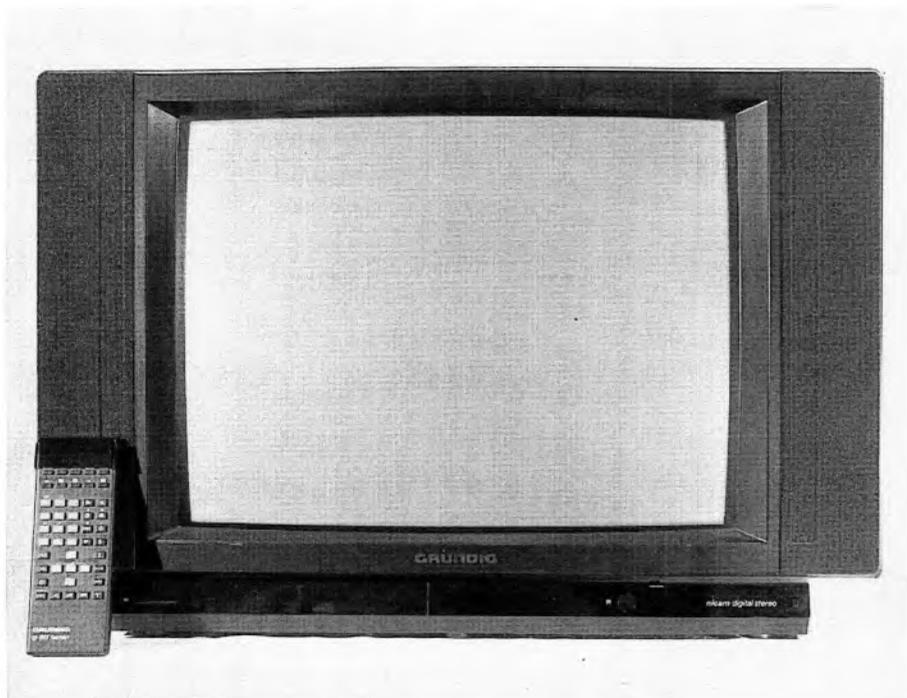
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Grundig's good reputation for quality German engineering, built on tape recorders back in the '50s, has stood the company in good stead throughout the intervening years and many changes. Now an autonomous part of the Philips empire, there is some shared technology (in both directions), while Grundig fills a sizeable alternative niche by adding a hint or three of German accent in styling, ergonomics and presentation.

The *ST63-466NIC/FT/GB* – which I'll take the liberty of calling an *ST63* (even though the visible picture diagonal measures 59.3cms, more or less like all the others) – is an imposing and distinctive looking stereo (as opposed to monitor) style set, fitted with both NICAM and Fastext and selling at £650. I suspect only a German company would have come up with piano gloss black plastic as the major styling feature. It works tolerably well on the cabinet proper, quickly building up a patina of dust like the best Steinway, but the control panel/plinth trim spoils the whole illusion with an optically imperfect surface that looks uncannily like a cheap plastic moulding.

While the faceplate is a conventional, semi-matt FST, similar to that used in the Philips and JVC models, the Grundig cabinet shape continues the line set by the screen, and the whole shebang is tilted backwards by a few degrees. The shape reminds me of nothing more than a windjammer's topgallant, and is quite nice in its way, but the tilt is bound to increase problems with room lighting reflections in normal domestic surroundings.

I've had a few years on and off experience with an old 22-inch Grundig, but that didn't prevent the *ST63* from confusing me with the most impenetrable operating logic of all. A

perversely intermittent sample fault on the control microprocessor didn't help matters much – it worked perfectly the day I tried to demonstrate to editor JB why I'd got him to order up a second sample, and then went on the blink again three days after I'd refused Grundig's replacement as unnecessary. Fortunately, by this time all the tests had been successfully completed. Such is reviewing, and microprocessors for that matter . . .

A major difficulty in alignment is the absence of any on-screen graphics, further hampered by the fact that the 'neutral' setting as delivered was way too high on black, white and colour level. To be fair, some thought has gone into the handset layout, with useful colour coding. But there's a sprinkling of redundant buttons too, some explained, others not.

Main parameters are adjusted by first selecting which one and then using 'master' up/down buttons. These are nicely distinguished and centrally placed, but either side of a single 'OK' key, which sends everything back to the neutral position. And because you have to look carefully at the screen not the handset when making picture adjustments, I kept hitting OK by mistake, which doesn't strike me as clever ergonomics. The set also took a perverse delight at unmuting its loudspeakers at every opportunity (including selecting programme one on the Mitsubishi handset!).

There's a fair sprinkling of controls on the set, just in case you happen across the manual while searching for the remote control, and a fair sprinkling of interface socketry, including Y/C for S-VHS, but regrettably audio output is only available from SCART or extension speaker and headphone sockets. The metal grilles either side

of the screen were too opaque to check the speaker complement without causing damage, though I suspect a single driver per side.

PICTURE AND SOUND QUALITY

Once tuning and alignment had finally been accomplished, the picture quality proved pretty capable overall, if a little undistinguished and less than the best in the test. The width control was set a little narrow, and there was some colour misconvergence at the top of the screen, but the overall rating is comfortably above average. Geometry is pretty good, albeit with some instability, while resolution is comfortably adequate. RF sensitivity is good on picture and text, though weak signals add some grain and a little colour patterning. Colour balance is acceptable neutral, leaning a touch towards the green/yellow sector.

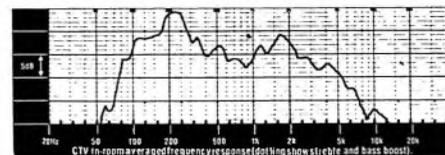
The sound quality isn't all that exciting either, though again there are several which fare much worse. The forward facing speakers do help, particularly in focusing the slightly phasey stereo, but the response unevenness is a little too obvious to escape without some censure on coloration grounds – there's far too much 'oompah' and 'boxiness'. Although nasty discrete booms and buzzes were less obvious than usual, permitting reasonable loudness on music programme from a tolerably powerful amplifier, the enclosure can be felt to be vibrating even at quite low volume levels, and makes a substantial contribution to the perceived coloration. Regrettably, the SCART-derived NICAM sound was not rated too highly, on grounds of excess 'richness' and a slightly 'spitty' extreme top end.

CONCLUSIONS

The *ST63* is a pretty competitive if somewhat undistinguished all-round performer in a nicely distinctive suit of clothes. Unfortunately it is hampered by the lack of on-screen graphics and fairly inscrutable control logic, and slightly disappointing sound quality.

GENERAL DATA

Size (max. w x h x d)	74.7 x 51.5 x 41.5 cms
Screen size (diagonal)	23.3 ins/59.3 cms
Screen convexity (horiz. x vert.)	1.9 x 1.2 cms
On-screen graphics	No
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext
Stereo audio output	Speakers or SCART only
SCART	1
S-VHS (Y/C component)	Yes
Headphones	Yes
Price	£649





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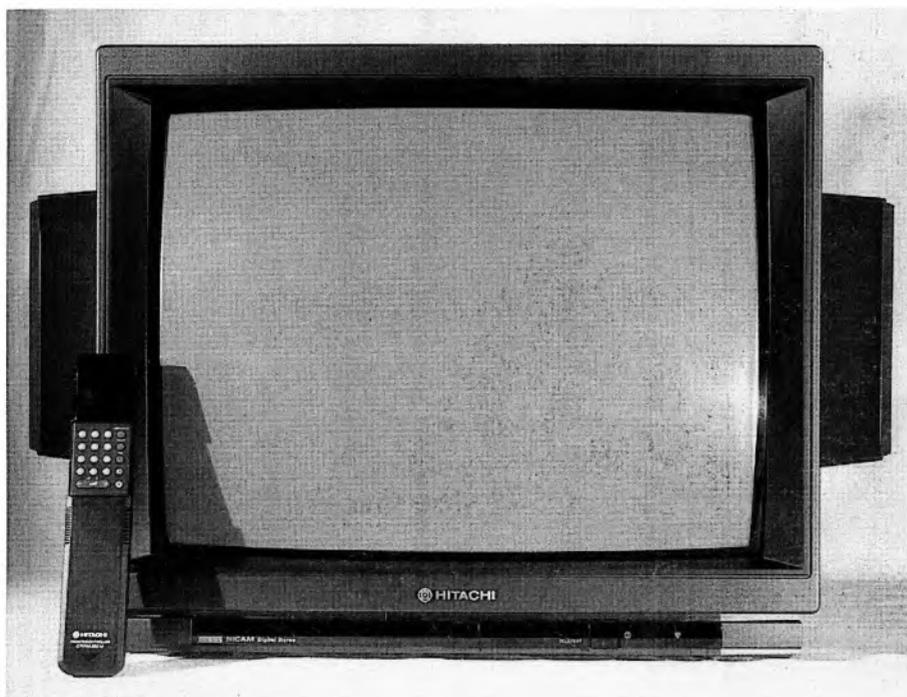
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HITACHI C25-P759

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One of the first Japanese companies to undertake CTV manufacture in the UK, Hitachi is also arguably the most successful too, and is currently challenging the two leading European brands for UK market leadership. A quick check in my product guide shows that the *C25-P759* is from a new and more upmarket range of CTVs, as part of a strategy which is reinforcing the brand's premium image (and profit margins), so a full complement of luxury features is to be expected in a model which is attempting to justify a \$699 pricetag against competition such as Sony and Panasonic.

Small is beautiful when you're trying to persuade the Great British Public to replace its ageing 22-inch sets with larger 59cm FSTs (instead of the 51s which still take three quarters of the market), and in this respect the *P759* is better than most and the equal of any. The frontal area is only an inch or two larger than the screen, and the plinth is so narrow it's a surprise to find a little clutch of control buttons and audio jacks lurking beneath a tiny flap – enough to get it up and running if the dog makes off with the bone-shaped handset, though not without finding the manual first.

Small from the front, the depth of the charcoal grey cabinet is greater than most (which is mighty convenient for stacking purposes), creating an attractively squat, almost cuboid appearance. The tube/faceplate has a fairly standard FST profile and a fairly reflective finish, so some care may be needed with siting, so the screen doesn't pick up on lights and windows (keep it low down is usually a good start). The extra cabinet depth has allowed Hitachi to perform a neat looking trick with the loudspeakers. These are mounted in moulded plastic 'ears',

which may be left flush with the sides or swung out to about 45 degrees. As far as torchlight can determine, there's just a single driver each side, and this is already slightly angled forward.

The manual starts pretty well, but gets a bit bogged down in overcomplexities on page five. The control microprocessor is clearly very capable and flexible, and straightforward operations tend to get bogged down in multi-stage protocols. For example, it's nice to be able to store specific adjustment settings independently for each programme source, but even resetting the 'normalised' setting requires a six-stage operation, compared with a single button push on the Philips set.

If both set and control ergonomics have elements of opacity, the handset shows real design thought. Shaped not unlike that original ergonomic yardstick, the B&O phallus, it's an object lesson in intuitive ease of use. The 'normal' position leaves visible 17 small but clearly coded and labelled buttons and a rocker, to cover the main functions. Select text, and lift the flap at the front for the 12 text functions. To make picture and tone adjustments, retune, fine-tune, normalise or whatever, you slide back the battery cover a few inches and search for the manual.

Interface socketry is a bit quirky. Two different headsets can be powered to different volume levels, and extension speakers may also be used, but there's no audio line out as such, though SCART is an obvious option since someone's had the good sense to provide two of them. There's no Y/C component (S-VHS) provision.

PICTURE AND SOUND QUALITY

Initial attempts to adjust the Hitachi picture

to resemble the quorum of opinion represented by its rivals proved exceedingly frustrating. Set the white level against Alderman's shirt front as he returns to his mark prior to dismissing yet another England cricketer, and when the camera changes to a long view of the batsman returned to the pavilion, all the little players glisten too brightly. The test card confirms a luminance bandwidth which is peaked up quite significantly at 2.5MHz – not unlike the Sony but to a significantly greater degree. It's an aberration and distortion which sacrifices all subtlety in order to 'hype' the picture and hence exaggerate certain types of detail.

Resolution itself is about average, convergence only satisfactory, and geometry shows a slight tilt and is wider at the top than the bottom, which is particularly noticeable on teletext. The colour balance leans perceptibly towards cyan (turquoise, if you prefer).

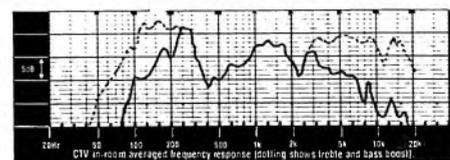
The sound quality is comfortably below average too, as you might guess from inspection of the graph. Perhaps inevitably the design only encourages buzzing and other relative movement, and various resonances could be heard from 63Hz up to 1kHz. The buzzing was most severe when the ears were left flat against the sides, while repeat traces with the speakers set at the three different positions showed virtually no changes in overall responses measured from the front. The saving grace is a modicum of welly available from the on-board amplifier, so extension speakers would be well worth considering. The NICAM sound (via SCART) is quite promisingly transparent, and amongst the best, though there's a lack of muting and some odd level ducking when changing channels.

CONCLUSIONS

Despite its nice control handset, neat appearance and promising NICAM, the *C25-P759* must be regarded as a disappointment which doesn't deliver anything like the picture or sound quality needed to justify its premium price, or enhance Hitachi's good reputation for that matter.

GENERAL DATA

Size (max. w x h x d)	57.5 x 50 x 48.4 cms
Screen size (diagonal)	23.2 ins/59 cms
Screen convexity (horiz. x vert.)	1.8 x 1 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext Plus
Stereo audio output	SCART or speakers
SCART	2
S-VHS (Y/C component)	No
Headphones	2
Price	£699



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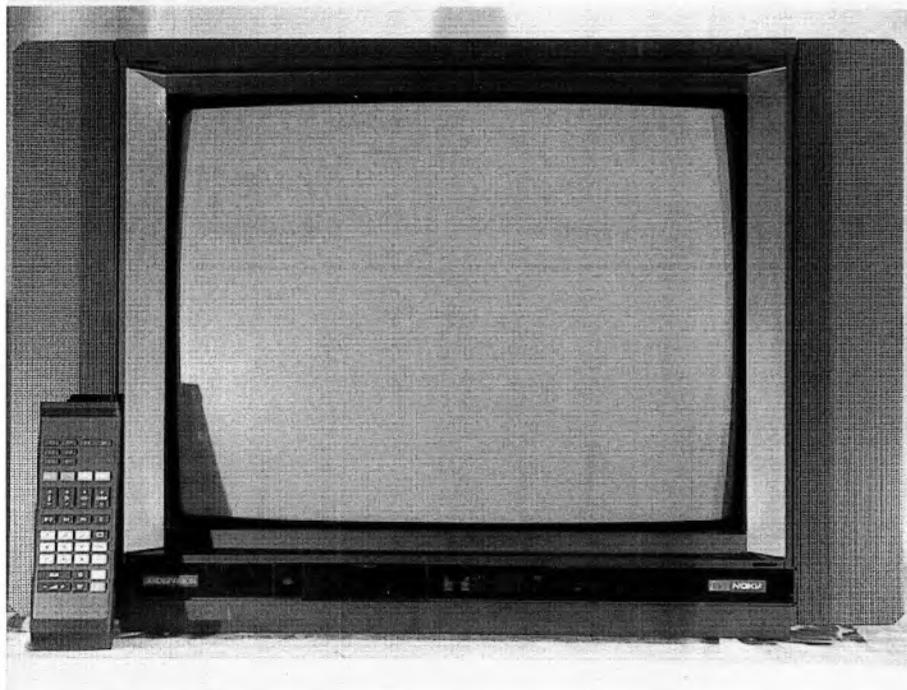
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As far as I can figure it out, ITT is a long established, German based consumer electronics brand that was fairly recently absorbed into the fast growing Nokia empire. Nokia is a Finnish multinational (I kid you not) that has done particularly well out of cellular telephony, and now probably ranks number three in Europe. Current UK ITT activity concentrates on CTV and VCR products, albeit with recent expansion into camcorder and personal/portable markets.

The company's particular claim to TV fame lies in pioneering digital signal processing techniques ahead of the rest of the world, though quite what constitutes a 'digital chassis' is fairly difficult to determine. Still, Digivision was something of a breakthrough in its day, and ITT certainly has the most experience of a technology that everyone else has since adopted to a greater or lesser extent, and which has had much to do with ensuring that the picture will stay in good alignment in spite of component ageing and drift.

Although it costs £70 less than some of the competition, the £630 3578 is one of the largest sets in this test group. It is also one of the heaviest, partly I suspect because the raw material of the cabinetwork is sawdust rather than crude oil – which could well help the sound, as will the forward facing speakers either side of the faceplate. Big, bluff, square lines are aided by a sombre grey and very matt finish, but this set will never look small.

The standard profile FST tube – a quite reflective example of the type – is set well back within a flush front alternative appearance. Use of a cover has pluses and minuses: it cuts down on reflected versus radiated light, which can improve black level under

bright conditions, but it will also add its own extra set of reflections, which can be a pain.

The manual is a pretty tedious affair, and there's even a teletext supplement for additional enlightenment. ITT seems to have developed its own particular Euroglyphic dialect, though with care the set buttons can be persuaded to do most of the essentials, while the handset is actually a model of its type, thanks to nice big buttons that are sensibly laid out and organised. Well it might have been had not some dumkopft or other decided to leave out the white level (contrast) rocker from the handset altogether and relegate it to the set, leaving you to try and make this second most important of adjustments (after volume) with your nose pressed to the screen. The other pain is that there are no status graphics to tell you where you are with the settings. Oh yes, and the ITT and Hitachi sets shared the same remote control protocols, so every time I carefully adjusted one, the other went out of adjustment, but I guess this factor won't loom too large in the typical domestic environment.

There's no attempt to provide S-VHS compatibility with a Y/C connector, but the hi-fi user is fairly well served by the limited range of socketry. You can take NICAM stereo digital or standard FM sound at speaker level out of headphone and DIN speaker sockets, or at line level out of SCART or phones, the latter subject to level control via the handset, which is very convenient in itself, and leaves the SCART free for VCR connection.

PICTURE AND SOUND QUALITY

I'm fast coming to the conclusion that CTVs are a cursed and perverse species, because the ITT managed to combine one of the best audio packages – probably the best overall

value of all here – with one of the more disappointing pictures. Well to my eyes anyway, for I can't deny that others commented favourably on its 'soft', 'gentle' characteristics. These are a by-product of a tightly controlled luma bandwidth which gave the lowest resolution amongst the test group.

On the plus side the picture is frequently the most stable, though cross colour effects are noticeable. There was very slight blue misconvergence and a slightly 'skew' and offset picture on our sample, but RF sensitivity and weak signal performance was good, and colour balance as neutral as any.

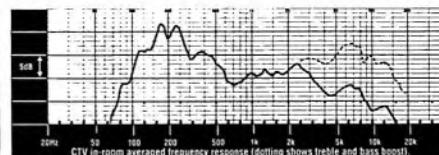
Even via the set's inbuilt remote volume control, the NICAM line-out sound, though a little lacking in oomph, is pretty respectable, which is one reason I'd like to hang on to this set, though I'd like to get ITT to sort out the muting first. The other is that the on-board amplifier/speakers also do a better job than most – though I expect much of the credit comes down to the fact that processed wood and glue has much, much better acoustic properties than large sections of injection moulded plastics. The sound isn't exactly great in the context of a half decent midi system, but a little treble boost gives a tolerable enough frequency balance, there's a reasonable quota of welly available, and the sound quality is refreshingly free from the plastic box boom that is such a tiresome factor in most others.

CONCLUSIONS

I don't think I could live with the soft focus picture which the 3578 provides, but I suggest you check out your own personal tolerance of this failing, because the audio side looks pretty good value, and is more practical than most – so much so that I'd be prepared to put up with the ergonomic foibles and lack of on-screen graphics.

GENERAL DATA

Size (max, w x h x d)	74.5 x 51.5 x 44.5 cms
Screen size (diagonal)	23.3 ins/59.3 cms
Screen convexity (horiz. x vert.)	1.8 x 0.9 cms
On-screen graphics	No
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext Plus
Stereo audio output	Yes
SCART	1
S-VHS (Y/C component)	No
Headphones	Yes (behind flap)
Price	£629



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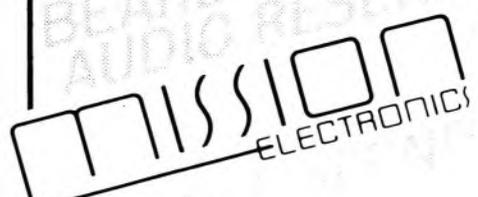
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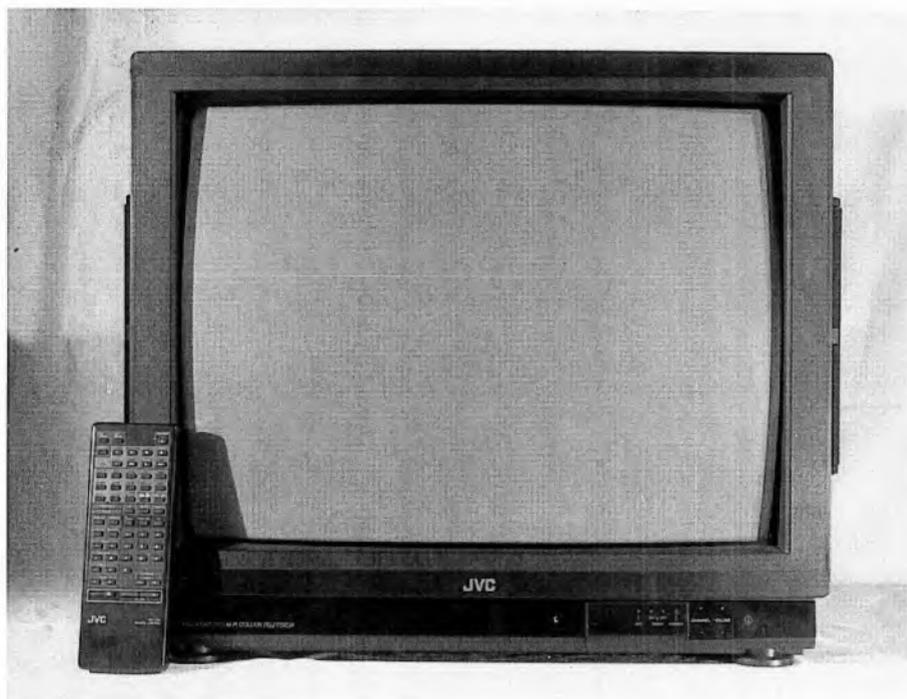


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The Japanese Victor Company has roots firmly planted in the hi-fi and music businesses, though its main attentions have been focused on the video market for the past decade. Precious few companies originate a world standard, but JVC engineers came up with VHS video, and have worked hard to maintain a technical edge in this important field. CTV is a natural product for a major VCR manufacturer, though JVC has taken its time in getting involved. But now that its own UK manufacturing capacity is available I'd expect to see the brand steadily increase its presence. And past history gives hope that the packages might provide flexible interfacing for audio/hi-fi as well as video/AV - it's about time someone did...

The squat and compact 'monitor' style S250 costs just £550, but that's because there's no NICAM decoding circuitry on board - which is somewhat surprising, since JVC was the first to demonstrate such equipment. The current policy seems to be to market NICAM as a VCR feature, on the quite rational basis that it's the best place to put it (so you can record easily in stereo). But that overlooks the fact that if your VCR is a two year old Hi-fi model and your CTV seven years old, you're not about to change the video just to get NICAM.

NICAM notwithstanding, it's a stereo audio set, with purposeful little two-way loudspeakers poking out either side from the back of the set. The casework itself is matt, near-black plastic mouldings, while the faceplate looks a standard enough FST profile, mid grey in colour and with a quite reflective surface. There are real on-set, visible controls for handling lost remote start-ups, and a pretty intimidating collection of identical buttons underneath the flap

- thankfully with real English legends instead of Euroglyphics.

This is a very flexible model in terms of the amount of options available to the user, which is a worthwhile point for enthusiasts to note, and it's backed up by - indeed partly relies upon - the best on-screen graphics among the whole test group. But there's a corresponding complexity in the operational protocols, which I'm sure some might find difficult to master. This is not helped by an arch manual and an even archer remote control handset, both of which make greater emotional demands than I was able to invest. I'm sure it's all there, and probably a bit more as well - like ordering the on-screen graphics in German, to impress the au pair. Pity there isn't a permanent programme number though.

The ergonomics are fundamentally perverse. You spend five minutes carefully adjusting the four picture parameters (it takes that long), using various cycling combinations of four close-set identical buttons, then go for the fifth to store it into memory, hit the one above by mistake and you're back 'normalised' again in a trice. I keep notebook and pencil handy, as analogue hardware memory back-up. The flexibility is helped by two SCARTS and Y/C (S-VHS etc) socketry, plus loudspeakers and headphones, but no line level audio as such (but there's no NICAM, so you're not likely to need it).

PICTURE AND SOUND QUALITY

I find it a little difficult to forgive the vast disparity between the 'normalised' picture settings of the set as delivered, and that required to give the best possible picture. I finally settled on colour -4, brightness +21,

contrast -24 and detail +20 on the +/-30 tuning scales. Although there are occasions when the extra contrast 'headroom' can be useful, I doubt that many consumers would have the confidence to standardise so far from the 'norm' without positive encouragement in the manual, which is not given. It looks much more like a cunning subterfuge to ensure that the JVC has a much higher contrast (white level) than its rivals when sitting on the shop shelf.

The picture itself is really pretty good, with fine resolution (towards the top end of the detail control range, but not too high or it starts peaking lower down), a nice even luminance response, good convergence and respectable geometry - it's just a little too wide across the middle of the screen, giving a slightly 'bloated' effect at times. The colour balance tends slightly but noticeably towards purple/blue and away from yellow/green. Although highly capable in a screen monitoring role, unhappily our S250 was let down by poor RF tuner performance, probably due to IF misalignment, and this caused significant blurring that made the set comparatively fatiguing to watch for long periods.

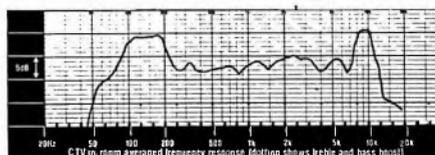
That is all the more a pity because the JVC turned out to have comfortably the best sound amongst the monitor style models, well up amongst the sets with forward facing speakers. You only have to look at the curve to realise that the tone controls are hardly necessary, and that the midrange is the most even of all. (The rather alarming treble peak doesn't sound as bad as it looks, and can be tamed a little to taste). And there's enough welly for most day to day purposes.

CONCLUSIONS

Used as a monitor (as fellow *Choice* reviewer AG has elected to do), the S250 is clearly an excellent selection, with great flexibility and even a half decent on-board audio capability, though I admit I never found the white balance quite to my own taste. It would obviously work well in tandem with a NICAM Hi-fi VCR, but standalone reception is compromised by the weak tuner performance.

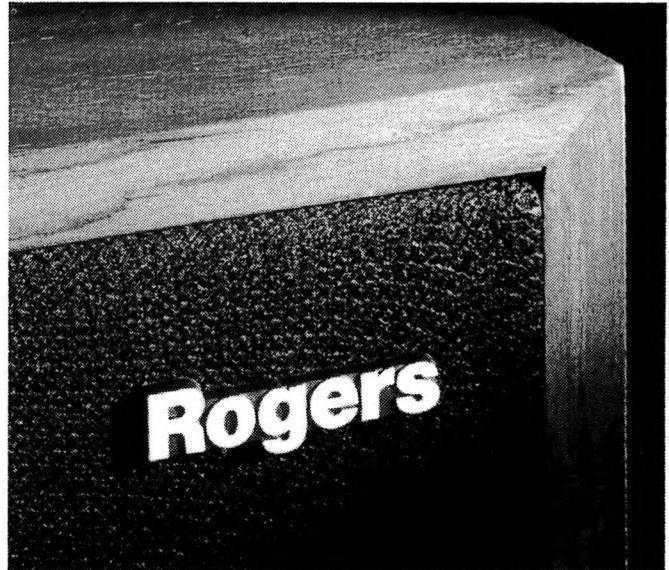
GENERAL DATA

Size (max, w x h x d)	65 x 50.5 x 44.5 cms
Screen size (diagonal)	23.2 ins/59.3 cms
Screen convexity (horiz. x vert.)	1.9 x 1.1 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	No
Teletext	Fastext Plus
Stereo audio output	speakers or SCART
SCART	2
S-VHS (Y/C component)	Yes
Headphones	Yes
Price	£550



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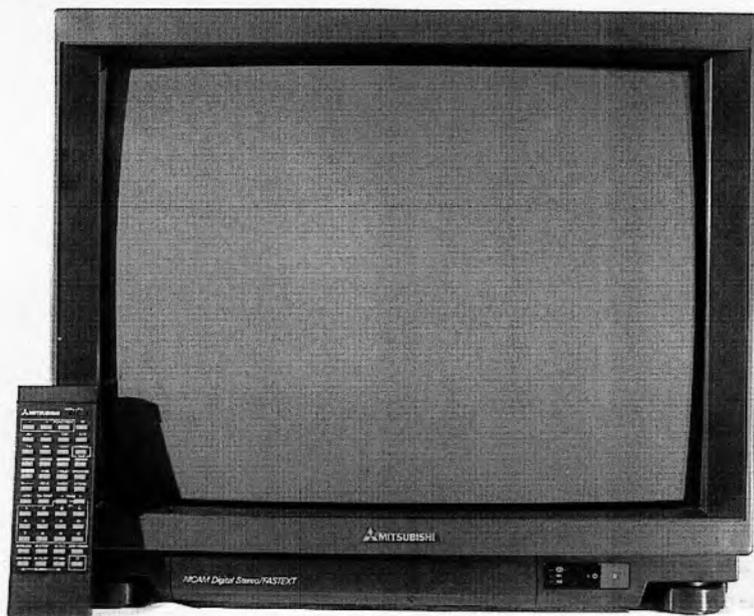
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The 2553 is amongst the most compact of the sets assembled for these reviews, with just the silly, cheap looking feet a minor indiscretion in what is a visually discreet charcoal grey package with an unusually dark (highly reflective) screen. This is one of Mitsubishi's own (see above), though the faceplate geometry conforms pretty closely to the FST 'standard'. The speakers are angled forwards and outward but mounted towards the back of a rattly rear cover.

I can't say I enjoyed the manual all that much, or the ergonomics themselves for that matter. There are plenty of buttons on the set, with a pretty nasty bit of code breaking practice inscribed on the inside of the hinged cover, and a couple of lurking switches that need to be put in the right place. There's no permanent indication of what programme you're tuned to, although you can call up a little on-screen insert from the remote handset.

The real sin of omission, however, is that the tuning system entirely ignores the concept of channel numbers, and is entirely

reliant upon scan seeking. The rather tacky indicator graphic is far too crude to ascertain which channel number and transmitter you're tuned to. Given that I am pulling in 12 channels from three transmitters, only one of which is broadcasting NICAM signals, and that for consistency's sake I needed to assign specific transmitters to specific programme numbers, you will realise my relationship with the set did not get off to a good start.

The on-screen graphics is something of a palliative, though they're my least favourites of the type, and provide an excuse to put all the up/down controls on three buttons, one to select, the others to adjust. The system is learnt quickly enough, but becomes tiresome to use for delicate adjustment, particularly with the constants employed here. The handset has no fewer than 48 identical buttons arranged in strict ranks with no attempt at grouping and only minimal graphics to help, along with legends that are difficult to read in subdued lighting. A shift key assigns all 48 to operate a Mitsubishi VCR; I wish you luck here...

Teletext seems to have a whole variety of features, most of which I haven't quite got around to mastering. The interface socketry is adequate enough, but is geared more towards video than hi-fi activity. The only audio output is line level via the solitary SCART, and a headphone socket behind the front panel.

PICTURE AND SOUND QUALITY

It has been a struggle getting past the ergonomics of this set, so it's just as well that most of the rest of the story turns out to be a lot easier. Colour balance apart, where the 2553 is out on a bit of a limb, towards the green/cyan sector of the spectrum, it's

clearly one of the two or three very best, thanks largely to a very nicely shaped luminance bandwidth.

Resolution and convergence are both good, and although there is slight peaking at the LF end (1.5MHz), the picture remains good to look at, helped by fine black level definition – though make sure you site the set out of reflection range of light sources and windows. One curiosity is that the tube is slightly overscanned, so the images themselves are a shade larger than those on other sets, while the field of view is marginally cropped at the edges to compensate. And our sample showed slight vertical shadowing down the left hand edge.

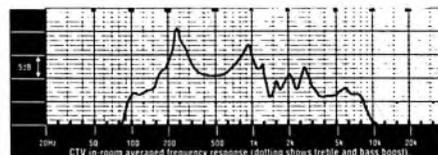
The sound is significantly less impressive, though not perhaps quite as bad as the graph, the construction and the single elliptical speaker a side might suggest. While the curve looks a shade like the route Hannibal took into Italy, there is reasonable balance 150Hz-9kHz. It's pretty untidy and therefore distinctly coloured, the tone control action is rather bizarre, there's not much bass below 100Hz, and the cabinet buzzes quite enthusiastically if provoked. But the amplifier shows some enthusiasm for its task, and there's plenty of volume available for the tolerant, which drags the sound up to around the average for the group as a whole. NICAM via SCART sounds rather good, but muting could be improved.

CONCLUSIONS

Despite my dislike of the tuning, ergonomics and graphics in that order, performance-wise the 2553 delivers what is possibly the best overall compromise of all the sets, in just about the smallest package of all and at an entirely reasonable £649.99, so Recommendation is inevitable. The picture quality is clearly out in front of the pack, assuming the colour balance doesn't distract. The on-board audio just about passes muster, but it's a crying shame there isn't a pair of audio output sockets for more convenient hi-fi connection.

GENERAL DATA

Size (max, w x h x d)	57 x 49.8 x 49 cms
Screen size (diagonal)	23.5 ins/59.5 cms
Screen convexity (horiz. x vert.)	1.8 x 0.9 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext Plus
Stereo audio output	only via SCART
SCART	1
S-VHS (V/C component)	Yes
Headphones	Yes (behind flap)
Price	£649.99



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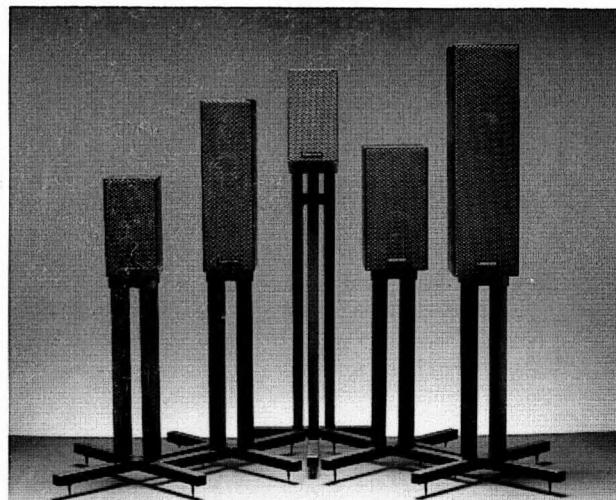
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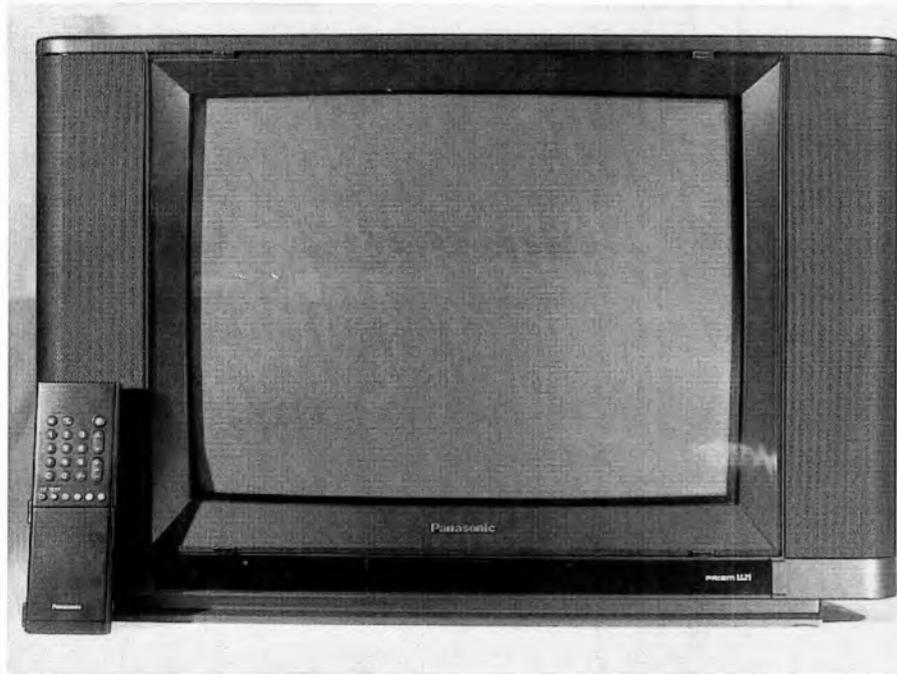
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Panasonic is the mainstream brand of Matsushita, the biggest consumer electronics company of them all, and is very active at the premium end of all the various UK market categories, especially CTVs and VCRs. The new *Prism* series represents a major investment in the UK manufacture of luxury hi-tech CTVs, and has a number of interesting features alongside a highly distinctive styling package.

The weight alone would seem ample justification for a £699 pricetag, but there's plenty more to distinguish this substantial set. It will certainly be a little too bulky for many tastes, though it's handsome enough in its way, and there is some justification for the size in the efforts made to provide 'hi-fi' sound quality – proper enclosures load the two two-way speakers that lurk either side of the screen. The shaping somehow manages to imply tradition and hence wood – a touch of the '50s somehow comes across – although the casework is actually moulded plastic, while the superb standard of finish, even extending to the control flap, creates a real impression of craftsmanship (except someone forgot to leave a hole for the headphone plug).

The line of the set follows the contour of the faceplate, which is recessed behind a flatter glass window. Such a screen serves to reduce the relative contribution of incident light versus radiated light, especially in bright ambient conditions, but the downside is that it introduces an extra set of reflections which don't coincide with those of the faceplate itself.

The CPT (colour picture tube) is something a bit special too, since the *Prisms* are the first commercially available sets to be fitted with the new Invar mask tubes from

Philips Components. Invar is an alloy which maintains its shape well with wide temperature changes, and this allows the tube to be driven much harder than before, at a higher EHT voltage, so as to maximise the black/white luminance dynamic range.

You can persuade the hidden buttons on the set to kick it into life, given a bit of help from the clear and detailed manual, but the handset is big enough to take some losing, so you'll probably only need to address the set for storing new preset stations or adjusting picture 'sharpness'. Interface socketry is adequate, though not oriented towards convenient hi-fi interconnection. External speakers may be driven, internal ones switched off, while a SCART and a set of camcorder/S-VHS sockets provide for video ancillaries.

After wrestling with all manner of ergonomic disasters elsewhere, the handset itself is an absolute joy. Big, clearly labelled, colour coded, sensibly grouped buttons for the essentials are left on view, secondary operations are tucked underneath a hinged flap, and the whole thing is linked by an entirely sympathetic logic and backed by excellent on-screen graphics and on-set LED program number. It's almost perfect, except that channel hopping lifts the audio mute, which is a pain in the proverbial.

PICTURE AND SOUND QUALITY

With things going so well so far, the innate perversity of CTV design was bound to come trundling on to spoil things sooner or later, and rather surprisingly it's the picture quality that lets the Panasonic down. As far as I can establish, this isn't a by-product of the new tube technology (Philips Components will be relieved to hear, even if it isn't my

favourite CPT yet on white balance), but something within the RF circuitry is introducing noise which fudges detail. The result, from broadcast signals, is an unacceptable amount of degradation and poor resolution.

Riding piggy back on a (Ferguson) VCR via the SCART lead, the *W1* gives a picture that at least matches the group average, though the action of the 'sharpen' remains somewhat obtuse. The new tube certainly seems capable of a wide dynamic range, though I remain less than totally chuffed by a degree of harshness of whites. Colour balance leans perceptibly towards purple and blue.

The sound quality is a vindication of the extra effort that has gone into this aspect of performance, and it's interesting to compare the Panasonic approach with that of archival Sony. It's difficult to favour one or the other, but the differences are quite dramatic. What this Panasonic achieves is sufficient bass output and welly, plus a tolerable enough overall frequency balance (with a little selective treble boost) to make music programmes genuinely enjoyable, and all within the confines of a single box.

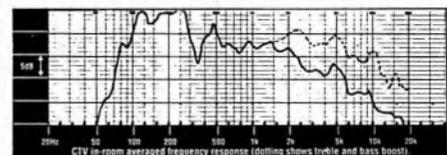
Midrange coloration is exceptionally good by CTV standards, but its lead here is all but thrown away by a noticeable chestiness caused by the usual low frequency box boom and resonances – 90Hz and harmonics thereof. SCART-derived NICAM sound is pretty good – one of the best of the bunch in fact – but I suspect the interfacing necessary to use this alongside baseband picture drive could prove a headache for even the best installation engineer.

CONCLUSIONS

Our *Prism W1* sample was severely hampered by poor RF tuner performance, though in almost every other respect it more than passed muster, even flying the odd colour or two. The inescapable (if somewhat inappropriate) interference, assuming our sample wasn't in some way defective, is that it would make a fine A and V monitor for a (NICAM, Hi-fi) VCR, but is somewhat lacking as a standalone item.

GENERAL DATA

Size (max, w x h x d)	76.5 x 52.5 x 47 cms
Screen size (diagonal)	N/A
Screen convexity (horiz. x vert.)	Behind cover
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fasttext Plus
Stereo audio output	Speakers or SCART only
SCART	1
S-VHS (Y/C component)	Yes
Headphones	Yes
Price	£699



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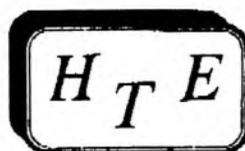
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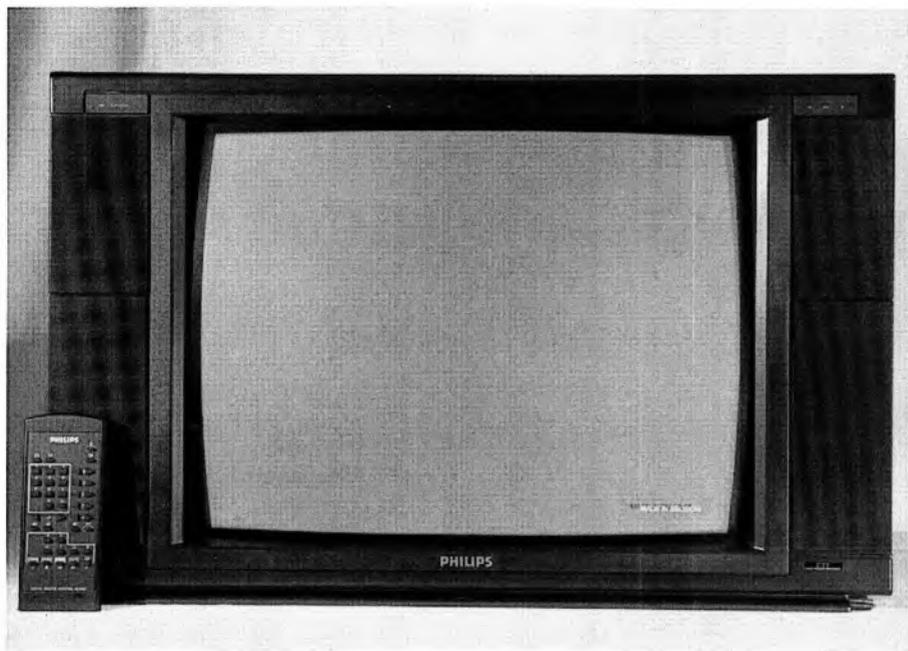
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slight image tilt, geometry is a shade off in the corners, and there is very slight misconvergence. Resolution is a shade below average, though the luminance response is subjectively nicely shaped. Sensitivity is average, though very weak signals can introduce slightly uneven grain. Colour balance is as neutral as any, shading fractionally towards the 'colder' (blue/purple) end of the spectrum. The slightly 'soft' picture quality doesn't set any records in any particular area, but must get close to providing an ideal compromise for all that.

The sound quality of the set itself isn't a disaster, though it's unlikely to quicken the pulse of the hi-fi enthusiast. It's pretty middle-of-the-road amongst the sets assembled here, which means it's OK for day to day use, but doesn't really cope with music at any level. It's helpful that the box stays under better control than most, aided by deliberate avoidance of most of the low frequencies that are apt to upset the casework. Barring a nasty 1.5kHz glitch, the response is tolerably smooth, rolling off sharply below 150Hz. Treble boost is mandatory, while some bass boost can be applied with care.

And if the audio line-out sockets render NICAM stereo with an ear-jangling edginess, the SCART turned out to give one of the nicest NICAM balances of all. Which means you'll either have to do something clever with SCART adaptors or take your VCR in via the RF (aerial) port, which is all a bit of a pain. And for some reason FM sound is several dB louder than NICAM sound.

CONCLUSIONS

At £599 the 5574 represents good value for money, as a sensible if rather middle-of-the-road all-rounder. The on-board sound is tolerable by TV standards, and SCART gives better quality NICAM than most. It's not the most elegant or ergonomic of sets, and has a few of its own idiosyncracies, but there's not a lot to deserve serious criticism either.

The Philips brand is not only long established in the UK CTV top three, its subsidiary Philips Components (née Mullard) is also the world's largest manufacturer of CPTs (colour picture tubes). There is therefore considerable strength in depth, both in technology and a model range which appeals to all tastes and pockets.

The £599 5574 reviewed here is a fairly conventional and conservative looking set in outline – an observation which by no means implies criticism, since both NICAM and Fasttext are part of the package. Its rather square and severe styling incorporates forward facing loudspeakers, so it takes up a bit more room than the 'monitors', but should have a sound quality head start. And width apart it's actually amongst the most compact of all these sets, containing the circuitry within a reasonable depth behind the screen, and in a neat and compact moulded rear bulge.

The conventional FST faceplate is set back within a shaped picture frame, and has a slightly matt finish – similar to that used also by JVC and Grundig. All is very black and semi-matt (or semi-gloss if you prefer), with a rather fussy collection of logos and legends scattered around the four corners. Mesh grilles flank the screens to cover the speakers, though only the bottom half is needed to conceal the three little drivers per side.

The top half of each side is a cleverly disguised flap which reveals what is by today's standards a veritable cornucopia of buttons – which will be a welcome feature for handset losers everywhere. It is also evidence that the chassis itself has been around for some time now, whilst its consequently limited on-board memory explains the regrettable lack of on-screen graphics – the memory capacity

required was pinched to provide the Fasttext facility.

The manual explains every operational sequence in almost painful detail. Tuning in *via* the instructions on page three is pure tedium, requiring degree level in Euroglyphic studies and leaving me ill-disposed towards the set from the start. The direct channel entry code is tucked away under Technical Information on page nine ... Things could only get better, which fortunately they did.

It's nice to have a discreet but legible programme number permanently displayed on the set itself, while the handset is amongst the neater and better organised of the breed. All (Philips) VCR functions are relegated to a shift key, leaving the handset as is to get on with the telly, and keeping the button count (comparatively) modest. It's nice to have separate up/down pairs for six different functions, though the buttons, logos and 'glyphics' could all be usefully larger, and – sin of sins – white level (contrast) is only available on the set.

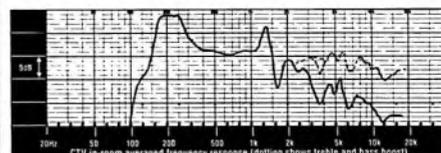
Interface socketry is a bit limited. There's a headphone jack and switch to turn off the internal speaker on the front, plus a solitary SCART and audio output pair on the rear. What ought to be a neat wheeze for A/V integration is that the latter's level may be adjusted using the set's remote volume control, but unfortunately the quality degradation is too serious (*vis à vis* SCART) for serious hi-fi use.

PICTURE AND SOUND QUALITY

The semi-matt surface promotes siting flexibility, though careful placement to avoid reflecting light sources is, as usual, desirable. Slight coil misalignment creates a

GENERAL DATA

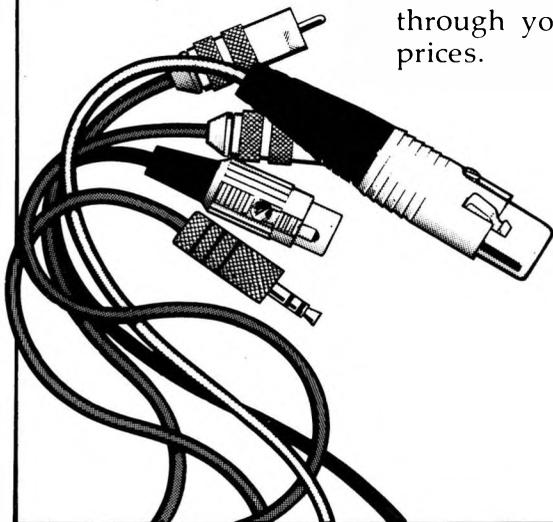
Size (max, w x h x d)	74 x 48 x 42.5 cms
Screen size (diagonal)	23.3 ins/59.3 cms
Screen convexity (horiz. x vert.)	1.9 x 1.2 cms
On-screen graphics	No
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fasttext
Stereo audio output	Yes
SCART	1
S-VHS (Y/C component)	No
Headphones	Yes
Price	£599



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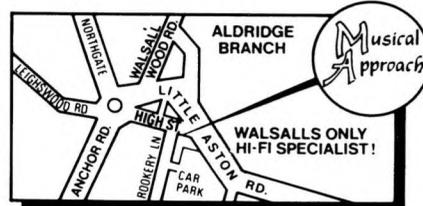
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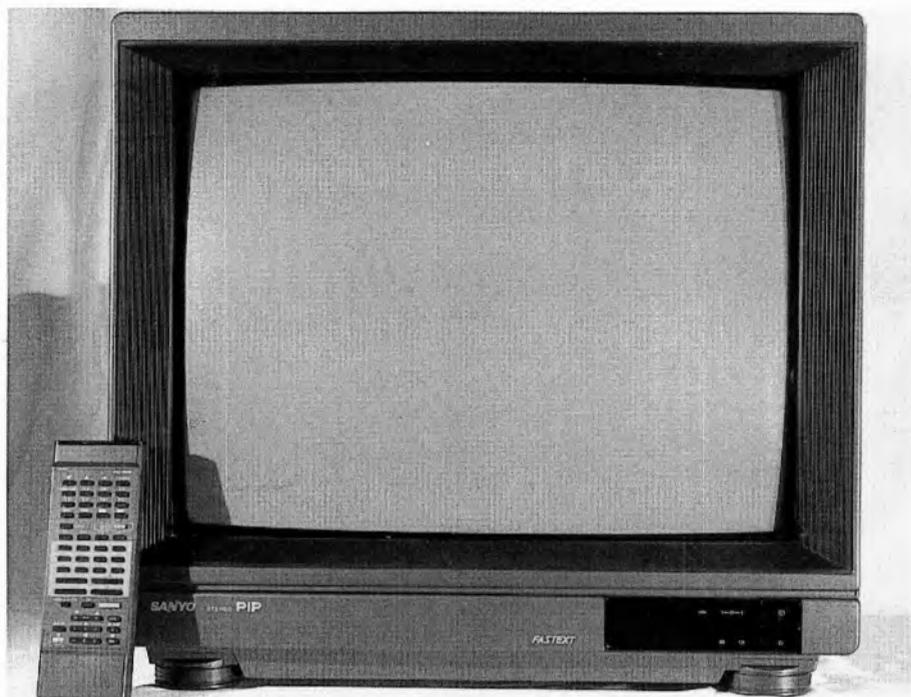
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While Sanyo is probably best known in the UK for low cost personal, portable and midi audio equipment, if you visit Electric City in Japan, you travel down to the second city of Osaka and a suburb called Maragouchi. There the vast headquarters factories of Sanyo and Matsushita stretch in each direction as far as the eye can see, either side of an uneasy divide formed by a bitter rivalry that goes back to the original schism 60 odd years ago, when Sanyo spun off from its larger parent/brother-in-law.

More recently, Sanyo UK has been following Japan's high tech lead, especially in digital imaging techniques for VCRs, camcorders and CTVs. Though not yet amongst the top half dozen brands, Sanyo nevertheless manufactures an extensive range of CTVs down in Lowestoft, including sets with advanced digital chassis and tricks, such as the PIP (picture-in-picture) feature fitted to this model. PIP needs the set to be SCART connected to a VCR, and can then display the latter's off-air or -tape signal in a little box inset within the set's own tuned picture (or vice versa).

A price list from a year ago lists the 2559 at £629 – a £60 price premium over the non-PIP 2558. But I gather the 2559 is now only £580, can be fitted with NICAM for an extra £50, while a 2558N (with NICAM, without PIP) is available for £599. The implication of all this is that you get quite a lot of TV for your money here, though I'm not sure the NICAM bits are actually in production yet.

This is quite an imposing 'monitor' set, fitted with a standard profile, quite reflective FST. It sits a little higher off the ground than most, with a generous control panel area and some rather silly looking feet, while the fact that it has properly balanced carrying hand-

les is a nice bonus, especially for us reviewers. However, the fact that the box is more of a mid than a charcoal grey helps mollify the visual impact. The stereo speakers are tucked right at the back and angled forward, so they don't intrude at all visually, though this is as unlikely to favour the sound as the suspiciously flexible mounting area. The set itself has a nice clear permanent programme number LED and several telltales, while the usual collection of identical pushbuttons lurk beneath the flap – thankfully labelled in English rather than symbollog.

The manual is a fairly soporific affair, not helped by rather rudimentary DTP (desk top publishing) production, but initial set-up is very simple and clear, and it took me seven minutes on the stop watch to get PIP up and running satisfactorily, which is some endorsement. I started to doze off when half of page eight was devoted to a discussion of FLOF, which is something to do with teletext, so you can see that there is an extensive range of operating features, for those blessed with patience and persistence.

Both qualities are required to come to terms with one of my least favourite handsets. It's too wide for one-handed operation even in my big fists, and although thought has gone into colour coding and grouping, the veritable forest of closely spaced black buttons gets on my nerves, and most of the major graphics and legends are difficult to read under subdued lighting. The really annoying bits are the way volume and mute are tucked away in the middle, while prominence is given to less essential keys like treble, 'stereo wide' and normalisation. It's nice to have fine-tuning readily accessible on the handset, but it's a curse to have to go and squint at the set to adjust white level

(contrast). I also take exception to the speaker mute lifting every time I change channels, but I guess the decent on-screen graphics are some compensation.

PICTURE AND SOUND QUALITY

One nice thing is that the factory-set 'normal' position gives a pretty decent result, so the 2559 came on looking good from the start. Even more impressive is the way it stayed that way, almost irrespective of signal type throughout the test programme, quickly establishing a key reference point against which others could be usefully compared.

I must admit to a personal subjective preference for a colour balance that favours yellow and red, and it's also true that I like operating it fairly high up the available contrast range. But the Sanyo manages to combine exceptional subtlety alongside a refreshing lack of fatigue, such as I have only rarely encountered elsewhere – a level of subtlety that seems much more capable than its rivals of creating some sort of impression of depth (HDTV style, albeit to a much cruder degree).

It's the lack of peaking in a beautifully tailored luminance response that is probably the reason why this set delivers fine detail resolution without resorting to 'hyping' the picture, though good convergence and geometry play their part.

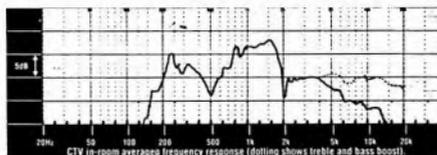
With no NICAM yet available to assess, it's probably best to draw a polite veil over an on-board amplifier and loudspeaker system that sounds as transcendently awful as the picture looks good. It's quite unusable and doesn't even go loud, though fortunately there's socketry available for speakers or line out, and the latter could be useful when NICAM is fitted (bearing in mind the SCART will be needed for PIP operation using a VCR).

CONCLUSIONS

I can't comment on the NICAM yet, but hope it's not as bad as the rest of the audio. But I can't avoid wholeheartedly recommending the 2559 as a fine picture monitor at a very reasonable price.

GENERAL DATA

Size (max. W x H x D)	58 x 54.5 x 45 cms
Screen size (diagonal)	23.2 ins/59 cms
Screen convexity (horiz. x vert.)	1.8 x 0.9 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	£50 extra
Teletext	Fastext Plus
Stereo audio output	Line and speakers
SCART	1
S-VHS (Y/C component)	Yes
Headphones	Yes
Price	£579 (see text)



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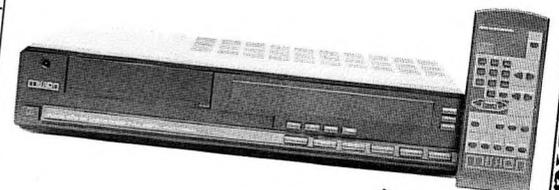
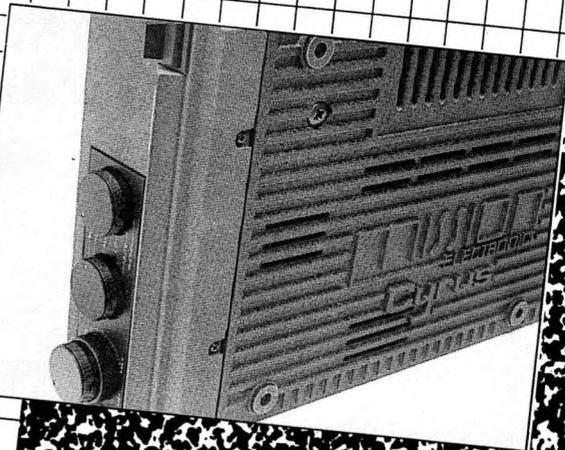
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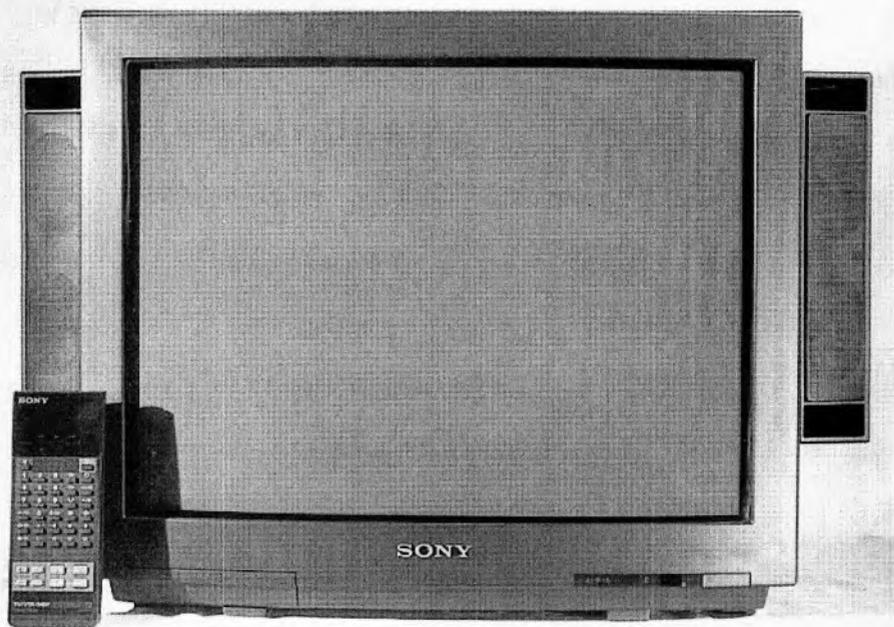
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E & OE

SONY D2512U

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RECOMMENDED



One of the first Japanese multinationals to set up UK CTV assembly, Sony is still the only one to have undertaken the massive investment necessary to manufacture CPTs (colour picture tubes), at Bridgend in Wales, for all European markets. The reason is that all Sony CTVs use the company's proprietary *Trinitron* tubes, which are quite different in screen shape – indeed, it could be argued that the *Trinitron* was the original FST. Sony has used this exclusively to establish itself as a major premium brand: its share in domestic large screen CTVs has recently grown rapidly to around 10 per cent, challenging the top three brands.

Where most faceplates curve across both vertical and horizontal axes, the *Trinitron* is virtually flat vertically, whilst maintaining a constant but sharper curve across the horizontal axis. This difference has major implications for picture geometry, in-room reflectivity and the styling of the sets themselves. Sony TVs look sexy, because *Trinitron*'s cylindrical-section faceplate is the only shape which allows genuinely smooth integration with the picture frame.

The brand new £699 *D2512U* is the only genuine monitor in the whole test group, as the speakers supplied are separate units which clip loosely one each side of the main box proper and connect to DIN outputs with their own strands of spaghetti. Better still, get an extension lead and set them a few feet away from the set. Looking like a Braun-designed fan heater, two narrow elliptical cone tweeters fire forwards through a discrete slot set a few inches back from the picture frame, while a bass/mid driver fires upwards through a potentially dust-trapping open mesh grille.

One unfortunate side of Sony's designer

lifestyle approach is a serious addiction of Euroglyphics – cabalistic symbols which contradict the aphorism that a picture's worth a thousand words. With the help of a local Sony dealer, we found the handset's secret compartment and cracked the tuning code. After that, operation became reasonably straightforward.

There's virtually nothing on the set itself, bar enough buttons (four) to coax it into powering up, changing channels and adjusting volume, at the expense of bruised knees. Plenty of sockets should ensure flexible interfacing (see manual, now hopefully published), and there's a couple of telltales, but no programme number.

All activity is centred on the handset. So it's just as well it's a pretty good one, helped by decent (if monochromatic) on-screen graphics. Or based on them them to be more precise, since all level adjustments bar volume depend on working through a seven-parameter cycle, digital watch style. It sounds intimidating, and can be tedious, but at least you get used to finding the right buttons easily. That's where this handset scores – there's just enough differentiation to help find the important bits easily, assisted by intuitive internal logic.

PICTURE AND SOUND QUALITY

Geometrically speaking, the *Trinitron* is the only tube to maintain vertical verticals, which is very nice. The consistency of the horizontal curve is also easy to get used to, though its comparative severity is not good for those sitting off-axis and does exaggerate the width of central faces. Although the screen is quite reflective, it's also nice and dark and the shape handily minimises pick up from high windows or ceiling lights.

Besides the usual contrast, brightness and colour, the *2512* has a 'crispener', which acts as a sort of tone control on the luminance. Resolution is nothing special, and the basic response is slightly but unavoidably 'hyped' at around 2.5Mhz, in a way which tends to emphasise detail at the expense of subtlety – the crispener merely tends to exaggerate this tendency. It's attractive in its way, but always looks just a little peaked up and 'forward' in the presence band, to use an audio analogy. There's also a mild LF problem, and slight vertical shadowing on our sample (probably not typical). The net result is a picture that is always interesting to watch, but not as relaxing or transparent as some. For some inexplicable reason, teletext mode came in with excessive contrast.

If the picture quality is mildly disappointing, the Sony redeems itself on the listening tests. It was simply the only television in our test group which almost manages to sound like a hi-fi system – all right, a midi system – at times, simply because the output of the speakers isn't severely coloured by TV box resonances, even with the speakers fitted.

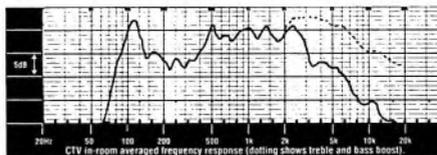
That said, neither loudspeakers nor on-board amplifier are much cause for celebration, even in a midi context. Power handling and loudness are certainly behind several of the others, and mid coloration is pretty severe, presumably due to the broad 500Hz-3kHz response plateau. Still, the *2512* makes enough of an attempt for normal day to day use, though it can start to struggle a bit with music program. The unfortunate fly in the audio ointment is that NICAM *via* SCART line-out sounds disappointingly 'quacky' and bandlimited, though in fairness it was a pre-production sample.

CONCLUSIONS

This is a clever package, especially as far as the speaker system is concerned, and is probably the best looker of all designwise. The slightly 'hyped' picture quality doesn't quite come up to expectations, but *Trinitron* geometry is its own reward, and the worthwhile integral sound package goes a long way towards justifying the price premium.

GENERAL DATA

Size (max. w x h x d)	57.5 x 48 x 46.5 cms
Screen size (diagonal)	23.2 ins/59 cms
Screen convexity (horiz. x vert.)	2.7 x 0 cms
On-screen graphics	Yes
Stereo sound circuitry	Yes
NICAM digital stereo decoding	Yes
Teletext	Fastext
Stereo audio output	Probably
SCART	x2
S-VHS (Y/C component)	Yes
Headphones	Yes
Price	£699





TV TECH TALK, CONCLUSIONS AND RECOMMENDATIONS

Paul Messenger explains how he assessed the sound and picture quality of ten tellys, and lists the Recommended models

Reviewing today's large screen colour televisions turned out to be a daunting task, simply because of the sheer complexity and flexibility of the modern CTV – especially compared to its predecessor of ten years ago. The simplicity of only serving 625-line PAL terrestrial broadcasting has been replaced by the need to cater to at least four other signal sources (domestic VCRs, camcorders, computers and CD-V), without getting tangled up in the whole satellite question. To fit the work into the time and space available, a number of assumptions had to be made.

The most straightforward decision for starters was to ignore the stands. The majority of the sets are normally supplied complete with 'flatpack' stands of one sort or another, though only four of these were actually delivered, which provides an admirable excuse to leave them out. Most include a handy VCR shelf, and loudspeaker style spikes are not of course necessary. User-friendly little castors are the order of the day, allowing the sets to be wheeled out easily for vacuuming (though the way they dig into a modern soft-pile carpet, and the stability of the whole shebang can give grounds for some criticism).

The evaluation process covers three distinct areas: picture quality, sound quality and

ergonomics, the latter covering everything from ease of use to interface flexibility. And since this is a hi-fi magazine, the coverage is consciously biased towards audio performance and hi-fi interface capabilities, rather than dwelling on the delights of computer enhanced teletext or concentrating on camcorder editing capabilities.

Terrestrial broadcast transmissions remain the prime programme source for most people, so most assessments of picture and sound quality use this as the starting point. S-VHS video delivers a usefully repeatable high quality alternative with baseband drive potential, and this provides a performance check if problems in the RF reception/processing circuitry is suspected.

A three-antenna rig on a cliff-top site in North Kent provides excellent signal strength from Crystal Palace, Dover and Sudbury transmitters. These feeds were available separately or multiplexed, and could be distributed using a Labgear Cablevision CM7298 distribution amplifier. Simple comparison between NICAM and FM sound was made by tuning the eight NICAM sets (plus the VCRs) to both London and Dover, for example. No attempt was made to investigate satellite broadcasting this time around.

Although now only available during antisocial hours, the BBC2 testcard remains an invaluable means of assessing picture quality parameters such as geometry (when is a straight line a straight line?, not on most television screens), convergence (colour registration and spillover) and resolution (fine and evenly portrayed detail). Extended watching of varied programming backed up (and usually confirmed) the testcard findings.

The televisions were treated like loudspeakers for in-room audio frequency response measurements, mostly accessed via SCART sockets for consistency. Any (sorry, many) rattles and buzzes were noted during sinewave excitation.

It is not feasible to simulate NICAM in the lab (hence the endless test transmissions), so still rare events like a top quality live stereo Prom broadcast (simulcast on FM radio) were rather spoilt by frantic plugging, unplugging and comparative listening between the sets and against a Naim N4701 FM tuner (with a 21-element aerial in virtual line-of-site to Wrotham). More conventional sequential/repeatable listening was undertaken using prerecorded stereo music videos, and normal day to day broadcasting sources.

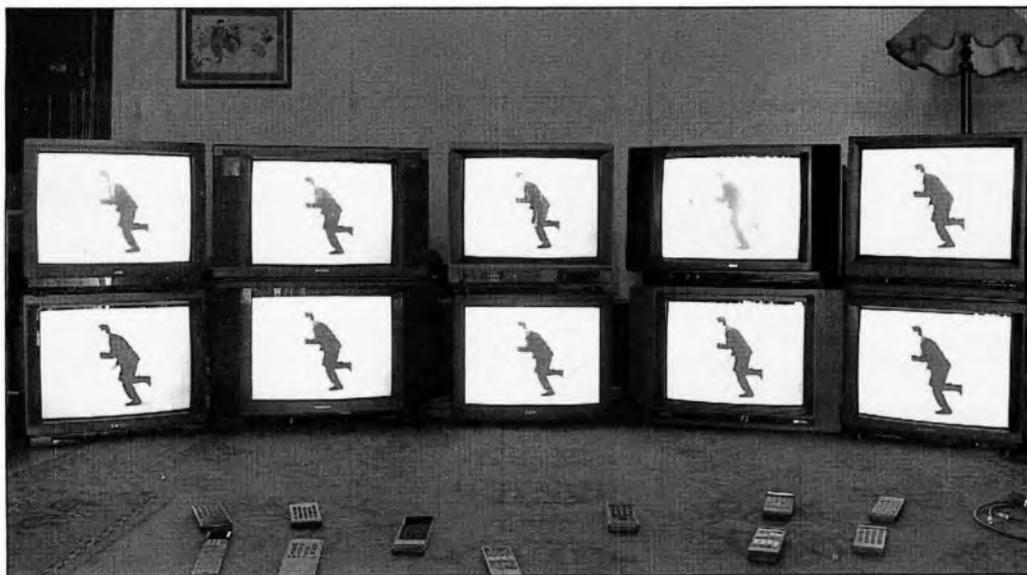
Assessing ergonomics

inevitably involves subjective judgements, the most difficult being the inevitable dichotomy between simplicity and flexibility. Those who actually enjoy spending the evening grappling with a hot handset and well-thumbed instruction manual may consider me unduly critical, but it is well known that consumers find highly complex handsets daunting and difficult – and a large percentage never even attempt to program VCRs for absentee recording.

Simplicity, organisation and good graphics/legends – on both the handset and the screen (vide Panasonic and Hitachi) – can create an operating system which is intuitively easy to grasp, rather than requiring the constant looking up of 'standardised' symbols that only the Eurocommittee which invented them can be expected to remember. More often than not the handset is overcrowded by too many identical buttons, often poorly labelled and grouped for easy use under the sort of lighting that is best for television viewing. Many will rarely be used – those for tuning in the TV, operating a VCR if you happen to have one from the same manufacturer or accessing some of the more obscure teletext functions will do for starters – and even the obligatory ten-digit numeric keypad ought really be tucked away by itself somewhere.

Volume/mute, up/down programme, on/off and maybe video/broadcast selection are the essentials that should be easily distinguished and given pride of place, while secondaries and tertiaries should be grouped according to their functions, and covered by hinged flaps if possible. With ergonomics dominated by remotely controlled microprocessors, Ferguson and JVC provide object lessons in supplying well designed minimal on-set controls which are just enough to get them up and running when the programme's starting and you can't find the remote, which is a definite plus.

Other important ergonomic factors include the flexibility of connections with various sources



Posing for a group shot – the ten tested tellys.

(an area where most sets could well be improved), the range of adjustments, and whether the steps are coarse or fine. It was a little alarming, for example, to find that a number of NICAM sets had not yet sorted out appropriate muting circuitry to avoid channel change pops and bangs when connected to outside equipment. However, in the end, ergonomics are a personal thing, as must be any value judgements. The wide disparity in the strengths and weaknesses of the ten CTVs reviewed shows that care taken to match the set to its likely application will be well worthwhile.

My particular thanks go to Ferguson and Mitsubishi for the loan of S-VHS VCRs and test tapes, Norman McLeod for substantial technical assistance, KTV for aerial rigging and equipment, Bandridge for a selection of SCARTs and adaptors, and engineers in various companies for advice.

CONCLUSIONS

The first thing to point out is that these televisions give you an awful lot of electronics and precision engineering (in the picture tube) for a surprisingly modest outlay compared with specialist hi-fi components.

CTVs ought therefore deserve a blanket recommendation for value for money, but it is rather frustrating to report that no one set in this ten-strong group is a genuine all-rounder that manages to perform well in all areas. Best Buys are therefore not appropriate under the circumstances, but a number of the sets are Recommended, either for broad competence or exceptional performance in some respect. But even those left unflagged tend to have certain strengths worth noting, so these too are included in the following resume.

Problem areas on the audio side include on-board loudspeakers combining with rattly, large plastic cabinets to give the sort of boom a ghetto blaster would be proud of. Perhaps only four of these designs could be considered partly successful in this respect.

Simple substitution of loudspeakers is often feasible and worthwhile, but much better results will be obtained by using an external amplifier as well, ie by integrating the TV sound with an existing hi-fi system.

But the whole question of linking TV, video and hi-fi together has not been properly addressed yet by most manufacturers. It's true that this has only really become a serious

issue over the last few months and in those areas of the country able to receive NICAM digital stereo TV sound. It's also true that VCRs tend to show better flexibility than CTVs in this area. But that's no excuse for CTV manufacturers not to fit a simple stereo pair of phono audio output sockets, if necessary just linked to the SCART socket the way Ferguson has done. It's not the best approach, but it's cheaper than adding a second SCART, and at least gives the option of accessing an on-board NICAM decoder without blocking the SCART you want to use to connect your VCR.

For space reasons I've dealt specifically with NICAM in this month's *Personal Messages* column, tucked inside the back cover. Suffice to say that there's plenty of promise, but various question marks still hang over the broadcasts, and considerable differences are found between different implementations, both in terms of the sound quality per se and in the cosmetics such as muting during channel change.

Differences in picture quality are no less marked to the experienced eye, though it's arguably true to say that the majority would be quite acceptable enough to the majority of consumers. For example, since a compromise must be made between colour neutrality and phosphor brightness, there isn't a single set which is entirely neutral in colour balance. All show one prejudice or another, and the trick is to find which one best matches your own – a bit like loudspeakers in fact, though here the term coloration is no metaphor. (Use live studio flesh tones if you can).

But a carefully considered purchase decision can go much further than that. Levels of ambient lighting, site in room in relation to lighting and screen reflection characteristics, and preferred screen geometry are all relevant factors, as is personal preference in appearance and ergonomics.

With all the adjustments available, A/B picture comparison is much harder than with loudspeakers (though you can keep the sets in the same room), and few if any retailers have acquired the necessary demonstration skills. Some guidance is offered in this month's *Perspectives* feature, though there's no substitute for experience and practice.

But given the vast number of hours a year most of us spend glued to the TV set, isn't it about time we started taking these

issues a little more seriously?

RECOMMENDATIONS

The on-set loudspeaker sound quality will be rendered redundant by anyone who takes the trouble to add a pair of extension loudspeakers, or feed a line level signal to a hi-fi system. So for yours truly at least the reprehensible noises made by the **Sanyo** are irrelevant in the context of the best off-air picture performance of all, and therefore it attains mandatory recommendation, though you may have to wait until the end of the year for the NICAM update, and I can't vouch for its sound.

Another recommended set which combines superior picture with indifferent sound is the visually neat **Ferguson**, which is also less costly than most. In fact you could afford to add the extension speakers and still have change from the price of some of the review sets. However, you're still saddled with a gutless amplifier so I'd be inclined to regard the **K5** as a picture monitor with NICAM output, a role it fills most practically and capably.

Another good all-rounder at a reasonable price is the **Philips** set, which is compact, has flexible interface socketry and usable on-board sound, though the off-air picture quality is a mite soft for my tastes.

Recommended as arguably the best all-rounder is the **Mitsubishi**, which has a picture quality that can match the best, plus a sound quality that at least has some welly, if not much subtlety. Once again, it's leading role is as a picture monitor, but you'll have to take care.

The fifth and final formal

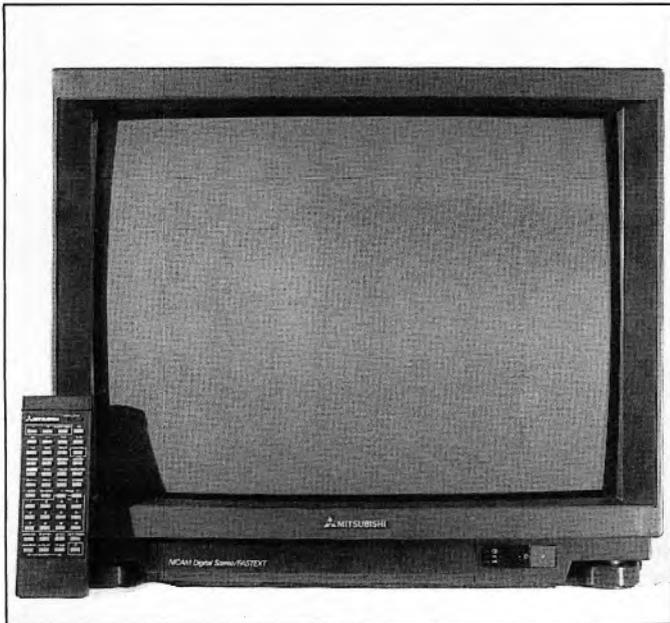
recommendation goes to **Sony** for the sound quality that can be easily achieved by the simple expedient of supplying detachable speakers that clip on the sides or can be sited elsewhere. The picture is a little hyped, which is something of a Sony tradition, but the *Trinitron* screen has its own virtues and rewards.

Even ignoring the ergonomic hassles, it's difficult not to see the **Grundig** as a marginally inferior (on the sound side) performer compared to the Philips, in a larger box and at a more expensive price.

The **ITT** would definitely have deserved recommendation for a standalone audio performance which rivals the significantly more costly Sony and Panasonic models. However, the off-air picture quality is fundamentally too soft focused, at least it is for my taste.

The **JVC** and **Panasonic** sets both gave well above average sound and tube picture quality but were let down by poor performance in their broadcast tuners. In my opinion these flaws are sufficiently serious to preclude formal recommendation. But those into SCART connected VCRs could gain the very real benefits of these two sets for probably at least 90 per cent of the time, relegating the on-set tuner to operating only when watching one programme while recording another.

Only the **Hitachi** combined indifferent performance on both picture and on-board sound, and even this one turned out to have a rather superior sounding (if not yet fully developed) NICAM signal.



The Mitsubishi 2553 STX – a good all-rounder, but stereo audio must be accessed via the SCART socket.



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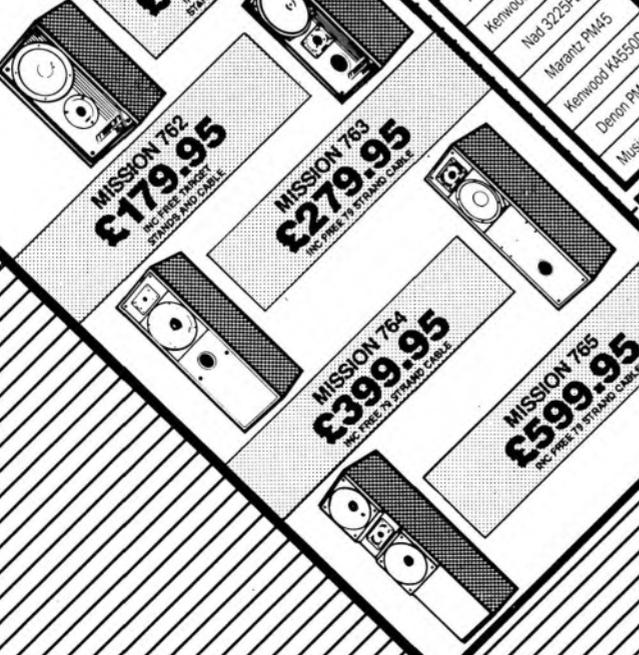
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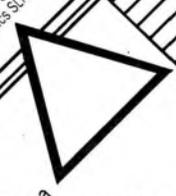
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ISLAND COMPACT DISC CENTRE, Parliament Square, Ramsey. (0624) 815521. Arcam, Ariston, Audio Innovations, Celestion, E.A.R., Marantz, QED, SD Acoustics, Snell, Sugden. Mon-Sat 9-5.00. Dem and home trial facilities. Free installation. Full credit, no 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, Rogers, Dual, N.V.A., Quad. Dem and home trial facilities, free installation, credit to £1000. Amex, Diners, Visa, Access. Service dept.

PHOTOCRAFT HI-FI, 40 High St, Ashford. (0233) 624441. No. 1 in Kent for Linn, Naim, Rega, Roksan, Exposure, Onix, Epos, Royd, Creek. But before you choose equipment choose where to buy it. Dem room, appts necessary. Home trial and free installation. Visa, Access, Bada Chargecard. 9-5.30 Mon-Fri (Wed & Sat to 5 only). Service Dept.

LANCASHIRE

MONITOR SOUND, 54 Chapel St, Chorley. (02572) 71935. A&R, Dual, Mission, Quad, Rogers, Rotel, Spondor, Thorens, Nakamichi, Yamaha, etc. 2 dem rooms. Open Mon-Sat, closed Weds. Free installation. Credit to £1,000. Access, Visa. Service dept.

LEICESTERSHIRE

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.

LINCOLNSHIRE

BOSTON HI FI CENTRE, 65a Wide Bargate, John Adams Way, Boston, Lincs PE21 6SG. (0205) 65477. Quad, Nakamichi, Creek, Ariston, NAD, Denon, Marantz, Castle, JPW, B&W. Separate demo studio. Home trial, free installation, service department. Access, Visa, Hi-Fi Markets ChargeCard. Tues-Sat 9-5.30 pm.

LONDON

A.T.LABS, 190 West End Lane, London NW6. (01) 794 7848. Mon-Sat 10-6. Two dem rooms. Access/Visa. Sony Hi-Fi News Best Dealer '86 & '88 (National). 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. BADA MEMBER 

DIN, 25 Melcombe Street, London NW1 6AG. Tel. (01) 224 4413. Roksan, Quad, Denon, Meridian, Mission, Celestion, Krell, Apogee, Arcam, Nakamichi. Full demonstration and delivery. Free installation. Access, Visa, Amex, Diners.

DOUG BRADY HI-FI, 14-18 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 

GRAHAMS HI-FI, Canonbury Yard, 190a New North Rd, London N1 7BS. (01) 226 5500. FBA Dealer of the year 1985'. Linn, Naim, Rega etc. £300-£3,000-£13,000. BADA MEMBER 

HI-FI CONFIDENTIAL, 35/37 Marsham St., London SW1. (01) 233 0774. Open Mon-Fri 10-6, Sat 10-3. Creek, Denon, Hafler, Kelvin Lab, Musical Fidelity, Oracle, Quad, Rotel, S.D. Acoustic, S.M.E. etc. Large single speaker dem room. Limited home trial facilities. Export worldwide.

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 9-5.30, Thurs 9-1. Credit to £1,000. Access, Visa, Diners. Service dept.

KAMLA ELECTRONICS, 251 Tottenham Court Road, London W1. (01) 323 274. Amadens, Ariston, B&Q, Gale, Intatech, JPW, Linn, Mordaunt Short, SME, Systemdek, Thorens, Townshend, Ruark, Wharfedale.

KJ WEST ONE, 26 New Cavendish St, London W1M 7LH. (01) 486 8262/63. Fax (01) 487 3452. Arcam, Audio Research, Croft, Epos, Linn, Marantz, Musical Fidelity, Quad, Systemdek, Voyd. 2 dem studios. Appts. nec. Home trial. Free installation. Service dept. Major credit cards. Mon-Sat 10-6pm. (Late night Thursday til 7pm.)

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.

MIDDLESEX

A.T. LABS, 173-175 Station Rd, Edgware, Middx. (01) 952

5535. Mon-Sat 10-6. 2 dem rooms. Access, Visa. Sony/Hi-Fi News Best Dealer '86 & '88 (National). BADA MEMBER 

UXBRIDGE AUDIO LTD, 278 High St, Uxbridge, Middx UB8 1LZ. (0895) 30404 (Multi-line). 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 

HARROW AUDIO, 27 Springfield Rd, Harrow. (01) 863 0938. Mon-Sat 9.30-5.30. A&R, Audiolab, Cyrus, Denon, Dual, Heybrook, Linn, Monitor Audio, Musical Fidelity, Quad, Rotel, Tannoy etc. BADA MEMBER 
A.T.LABS, 159 Chase Side, Enfield, Middx. (01) 367 3132. Mon-Sat 10-6. Two dem rooms. Car Park. Access/Visa. Sony/Hi-Fi News Best Dealer '86 & '88.

MERSEYSIDE

IN CONCERT HI-FI, 144 Seaview Road, Wallasey, Wirral, Merseyside. (051) 630 5055. Denon, Kenwood, QED, Alexander, Spica, Shan Acoustics, Monitor Audio, Tannoy, Audio Dynamics, Dual, Systemdek, Ortofon, Audio Technica, Target, Musical Fidelity, Alphonson. Single speaker dem room. Home trial + free installation. 10-6 - closed Mon. Open till 8pm Thurs and Fri.

W.A. BRADY & SON, 401 Smithdown Rd, Liverpool L15 3JJ. (051) 733 6859. 'Largest choice of specialist Hi-Fi in N.W. £100-£20K'. All credit cards. 3 dem rooms. Closed Monday. BADA MEMBER 

PURE SOUND - Birkenhead 051 645 6690 24hrs. Acoustic Energy, Aragon, Audio Technica, Beard, Celestion, Deltac, Denon, Michel, Cyrodec, Ortofon. 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

BASICALLY SOUND, The Old School, School Rd, Bracon Ash, Norwich NR14 8HE. (0508) 70829. Arcam, Linn, Naim, Denon, Spendor, Heybrook, Audio Technica, Creek, Rega, Epos, etc. 2 comprehensive dem rooms. Home trial. Free installation. Visa, Access. HP facilities. Tues-Sat 9.30-1, 2-5.30.

SOUND APPROACH, 161 Unithank Road, Norwich. (0603) 622833. Kuzma, Ariston, Castle, Denon, Exposure, Ion, Royd, NVA, Roksan, Ruark, etc. etc. 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. Audio Technica, Denons, Goodmans, Rotel, Tannoy, Ion Systems, Thorens, Gale, BLQ, Royd. Dem room. Home trial and free installation. Mon-Sat 9.30-5.30 (Thurs 9.30-2). Service dept.

SOUND PRINCIPLES, 52 Queen Street, Wellingborough, Northants. (0933) 441907. Ariston, Celestion, Heybrook, Marantz, Mission, Nakamichi, QED, Rotel, Spendor, Yamaha and others. One demo room 22' by 11', well furnished. Home demo's by appt. Appts necessary. Free installation. Access, Visa + credit scheme available. Mon-Fri 10-6, Sat 9-5. Out of hour appts can be made.

NOTTINGHAMSHIRE

DEFINITIVE AUDIO, Nottingham. (0602) 813562. Voyd, Valdi, Systemdek, Helius, Audionote, Golding, JPW, Snell, Target, Pirate. Home demonstrations throughout Nottingham and East Midlands. Please telephone (0602) 813562 for further information.

CHANTRY AUDIO, Chantry Walk, 18a Eldon Street, Tuxford, Newark, Notts NG22 0LH. (0777) 870370. Ariston, ADC, Gale, Infinity, JPW, Kelvin Labs, Proton, Rotel, Space Acoustics, Thorens. Single speaker dem room. Appts preferred. Home trial, free installation. Access, Visa + credit facilities. Mon-Fri 10am-4pm. Sat 9-30-5.30. Sun home dem by appt. Closed Weds.

WEST MIDLANDS

ALTERNATIVE AUDIO Ltd, 93-95 Hobs Moat Rd, Solihull. (021) 742 0254 (sales), 0248 (service). The widest range of quality hi-fi and CD in the West Midlands. Tues-Sat 10-6. BADA MEMBER 

GRIFFIN AUDIO Ltd, 94 Bristol St, Birmingham. (021) 692 1359. Linn, Naim Audio, Rega, Creek, Denon, Nakamichi, Quad, Mission, Monitor Audio, Rotel. BADA MEMBER 

FRANK HARVEY 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, Wharfedale, Sennheisser. 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 A-Z 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.

FIVEWAYS HI-FIDELITY LTD, 12 Islington Row, Edgbaston, Birmingham. (021) 4550667. Alphonson, A&R, Denon, Meridian, Musical Fidelity, Nakamichi, Quad, Revox, TDL, Thorens, etc. Dem and home trial facilities. Tues-Sat 9.30-6. Free installation. Access, Visa. Service Dept.
BRIDGE HI-FI, 3 Tudor House, Bridge St, Walsall. (0922) 640456. NAD, Dual, Yamaha, Kenwood, Technics, Pioneer, Mission, Celestion, Denon, Mordaunt Short. Appts required. Home trial and free installations. Access, Visa, Diners, Amex. Credit to £1,000. 9.15-5.30 Mon-Sat. Service dept.

OXFORDSHIRE

ABSOLUTE SOUND AND VIDEO, 19 Old High St, Headington, Oxford. (0256) 24311. Arcam, Denon, Exposure, Heybrook, Linn, Marantz, Musical Fidelity, Mission, NAD, Rotel, Sony, Yamaha. 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, Mission, Tannoy, Quad, etc. BADA MEMBER 

WITNEY AUDIO & VIDEO, 28 High St, Witney, Oxford. (0993) 2414. A&R, Aiwa, Akai, Bose, Denon, Dual, Goldstar, JBL, Mordaunt-Short. Dem facilities. Mon-Sat 9-5.30. Free installation, credit to £1,000. Access, Visa. Service dept.

OXFORD AUDIO CONSULTANTS LTD, Cantay Hse; Park End Place, Oxford OX1 1JE. (0865) 790879. Oxford Acoustics, Audio Research, Krell, Magnephanar, Apogee, Aragon, Stax, Marantz, Wharfedale, Cambridge Audio. Home trial and free installation. Instant Credit. Access, Amex, Visa. 10-6 Tues-Sat. Service dept.

HORNS OF OXFORD LTD, 6 South Parade, Summertown, Oxford. (0865) 511241. Alphonson, Ariston, B&W, Celestion, Marantz, Nakamichi, Pink Triangle, Quad, Sony, Technics. Free installation. Service dept. Access, Visa. 9-5.30. Closed Thurs. BADA MEMBER 

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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, 2 Holland Court, High Street, Dawley, Telford, Shropshire. (0952) 630172. Cambridge Audio, Marantz, Onkyo, Rubric, Tannoy, Alexander, Appolo, Ion Systems, Audio Innovations, SD Acoustics. 2 dem lounge. Home trial. Free Installation. Service dept. Access, Visa. Credit facilities available. Instant credit subject to status. Mon-Sat 10-5 evenings/Sunday by special arrangement.

CREATIVE AUDIO, 9 Dogpole, 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.

SELECTED DEALER DIRECTORY

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 DE14 3DQ (0283) 33655. Audio Innovations, Arcam, Creek, Systemdek, Snell, Spendor, Cambridge, Pink Triangle, Quad, Voyd, etc. 2 dem rooms. Mon, Tues, Thurs, Fri, Sat. 9-6. Closed Wed. Free installation. Credit facilities. Visa, Access. Service dept.

ACTIVE AUDIO, 29 Market Street, Tamworth, Staffordshire. (0827) 53355. Arcam, Ariston, Celestion, Denon, Heybrook, Kef, Cyrus, Musical Fidelity, Marantz, Revox, Rotel, Rogers, etc. etc. Demonstration and home trial facilities. Account and credit cards. Ring for opening times and free 'Fact Pack'. BADA MEMBER 

MUSICAL APPROACH, 137A Newport Road, Stafford (above Royal London Insurance). (0785) 55154. Linn Products, Arcam, Creek, NVA, Revolver, Audiotec, Onix, Epos, Marantz, Rotel and more. Home trial. Free installation. Service dept. Credit facilities available, Access, Visa. 9.30-5.30 Mon-Sat.

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 AUDIO Ltd, 11 The Broadway, Woking, Surrey GU21 5AP (04862) 4667. Roksan, Exposure, Ion, Systemdek, Royd, Marantz, AR, Rotel, HK, Nakamichi, Oracle, Infinity, etc. 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. Dem and home trial facilities. Access, Visa. 9.30-5.00 Tues-Sat. Service dept.

TRU-FI SOUND AND VISION, 2 Central Parade, Redhill Surrey. (0737) 767400/766128. Akai, Aiwa, B&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.

SPALDINGS HI-FI, 352-4 Lower Addiscombe Rd, Croydon, Surrey. (01) 654 1231. 3 dem rooms + home dem. Free installation, credit. Mon-Sat 9-6, Tues to 8. Closed Wed. Service dept. BADA MEMBER 

TRU-FI SOUND & VISION, 10 Church St, Leatherhead, Surrey. (0372) 378780. Sony, Technics, Panasonic, Mitsubishi, Ferguson, Aiwa, Pioneer, Sanyo, B&W, Mission. Free installation. Credit facilities. Access, Visa. 9.15-5.30 Mon-Sat. Closed Wed. Service dept.

SUSSEX (EAST)

DEFINITIVE AUDIO BRIGHTON, Unit 8, Dyke Road Mews, 74-76 Dyke Road, Brighton BN1 3JD. (0273) 208649. Voyd, Systemdek, Audio Innovations, Helius, Audionote, JPW, Snell, Pirate Stands, Goldring etc. Home dems throughout Sussex. Credit facilities. Visa. Wed-Sat 11-7.

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)

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Home trial facilities, free installation, credit to £1,000. Access, Visa. Service dept.

CHICHESTER HI FI, 7 St Pancras, Chichester, W. Sussex PO19 1SJ. 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. Bose, Castle, Denon, JVC (Hi-Fi) and Portable TV, Luxman, Michell, Mordaunt-Short, Pickering, Tannoy. Dem facilities. Mon-Sat 9-5.30. Free installation, interest free credit. Visa. Service dept.

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ABSOLUTE SOUND AND VIDEO, 60 Fleet Street, Swindon. (0793) 538222. Arcam, Denon, Exposure, Heybrook, Linn, Marantz, Musical Fidelity, Mission, NAD, Rotel, Sony, Yamaha. BADA MEMBER 

YORKSHIRE (NORTH)

ELITE HI-FI, 178 Kings Road, Harrogate HG1 5JG (0423) 521 831. Voyd, Valdi, Avalon, Systemdek, Helius, Audionote, Goldring, Audio Innovations, Sugden, Marantz. Mon-Sat 9-5.30. Free installation. Service dept. THE AUDIO CLINIC, 2A Brunswick St, Bishopthorpe Rd, York YO2 1ED. (0904) 646309. ADC, Allison, Hafler, JPW, Luxman, Proton, Quart, Studio Power, Systemdek, Thorens and more. Second hand hi-fi available. Appt's req'd, home trial and dem facilities. Free installation. Access and Visa. 10-5 Mon-Sat. Service dept.

SCARBOROUGH HI-FI CENTRE, 53 Dean Road, Scarborough YO12 7SN. (0723) 374547. A&R, Bose, QED, Denon, NAD (incl. Monitor series), Thorens, Onkyo, Tannoy, Marantz, Ruark. Dem Room. Appts preferred. Home trial facilities. Mail order and part exchange. Visa, Access, Diners, Hi-Fi Markets, 6 months interest free credit. 10-6 Tues-Sat.

RICHER SOUNDS, 6 Feasegate, York YO1 2SQ. (0904) 645535. Probably the smallest hi-fi store in York, but stocks the A-Z of popular budget hi-fi at special discount prices. 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.

YORKSHIRE (SOUTH)

AUDIO PROJECTS, 45 Headingley Lane, Leeds LS6 1DP. (0532) 304565. Arcam, Audiolab, Creek, Heybrook, Linn, Musical Fidelity, Naim, Quad, Rega, QED. Appts nec. Home trial. Free installation. Service dept. Occasional 6 months int. free credit. 9.30-6.00 Tues-Fri. 2.30-5.30 Sat.

YORKSHIRE (WEST)

AUDIO PROJECTS, 45 Headingley Lane, Leeds. (0532) 304565. A&R, Audiolab, Creek, Heybrook, Linn, Musical Fidelity, Naim, Quad, Rega, etc. Tues-Fri 9.30-6, Sat 2.30-5.30. BADA MEMBER 

ERRICKS, Hi-Fi Experience, Fotosonic House, Rawson Square, Bradford (0274) 309266. Dem facilities. Sales/service agents for A&R, Linn, Quad, Naim, Nakamichi, Mission etc. BADA MEMBER 

HUDDERSFIELD HI-FI CENTRE, 4 Cross Church St, Huddersfield. (0484) 544668. B&W, Kenwood, Denon, Dual, A&R Cambridge, Musical Fidelity, Quad, NVA, Audio Lab, Philips, Mission, etc. Dem facilities - appointment req'd. Mon-Sat 9-5.30, Thurs 9-8. Closed Wed. Free installation, credit facilities. Access, Visa.

IMAGE HI-FI Ltd, 8-10 St Annes Rd, Headingley, Leeds. (0532) 789374. AR, Audio Lab, Denon, Linn, Marantz, Meridian, Mission, Monitor Audio, NAD, Quad. BADA MEMBER 

RICHER SOUNDS, 55 The Headrow, Leeds LS1 6LR. (0532) 455717. Affordable special deals on every big budget line from Akai to Yamaha; separates & systems. City centre store opposite Lewis's. 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.

SELECTIVE AUDIO, The Forge Cottage, 19 Crossgate, Otley. (0943) 467689. Exclusively handles Alphason, Roksan, NVA, ProAc, TDL, JDI, in the area and other

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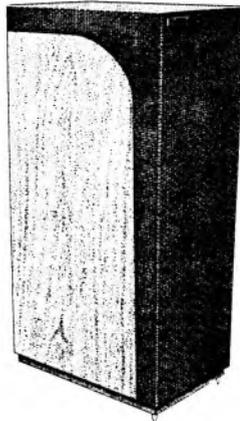
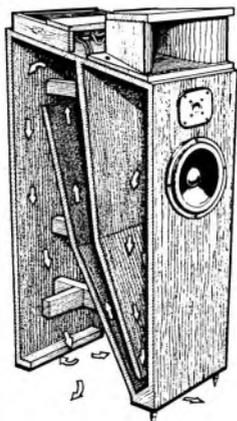
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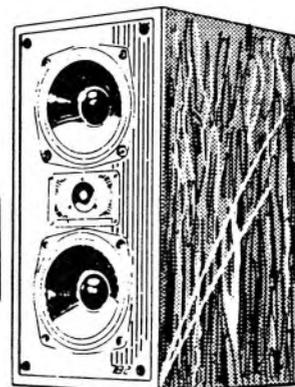
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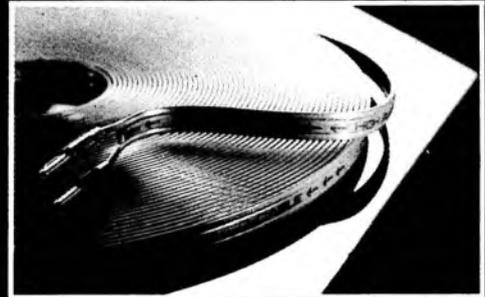
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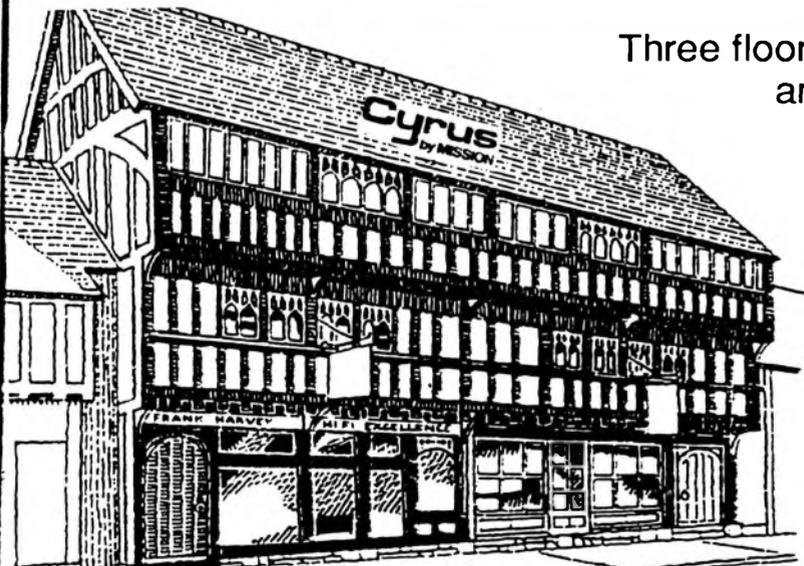
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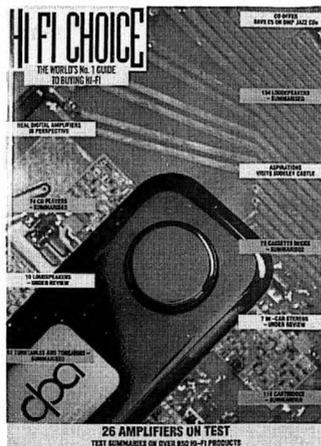
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THE DIRECTORY

The *Hi-Fi Choice Directory* was conceived as a reference guide to all the audio products reviewed by *Choice* that are currently available. The products are split into suitable categories, each with its own introduction containing information about the product type and its applications. They are particularly relevant to the uninitiated first time buyer and help sort out the order of priorities when buying a piece of equipment.

Each product along with its retail price is placed in its respective category in alphabetical order. For instance the Acoustic Research *EB101* is presently at the beginning of the Turntables and Tonearms section; however, the Ariston *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 – i.e. 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 – i.e. cartridge and speaker) system building is not quite that simple. These ratings make a useful guideline for shortlisting components, but only experiencing the actual combination will tell you whether it works for you.

The final column contains a reference to the issue of *Hi-Fi Choice* which featured the complete review. If you wish to get a better idea of a product by reading the complete review it is possible to order a copy (if still in print) through our back issues department. Every *Choice* issue contains a Back Issues page for this purpose.

The Directory is constantly updated with the latest reviews and price changes as well as having discontinued products removed. If a listed product is updated to a 'mark two' form and the alterations are purely cosmetic or not too extensive we sometimes leave the product in with its current model number and an asterisk to denote that it has changed since our original review was published.

SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems as strong as ever, and certainly represents the route taken by those who place sound quality ahead of other criteria.

Yet those who choose the separates route still have lingering doubts – usually completely unjustified – over the compatibility of components from different manufacturers. Gross incompatibilities are very rare nowadays, only likely to rear their heads amongst the most exotic components. Here the delicate art of 'supercompatibility' really takes over the major role and might be regarded as the key to 'real' hi-fi.

There are now three different pre-recorded music media competing for the attention of the hi-fi user, and to go for all three will either cost a lot of money or involve substantial compromises in the sound quality of each. For this reason many separates purchasers may start with just one source, adding others or a tuner when funds permit.

There will always be controversy over the relative qualities of LP, CD and cassette. LP is still the choice for ultimate sound quality – particularly for those prepared to spend a substantial sum on a good quality turntable system. Furthermore the vinyl repertoire is still the cheapest, largest and most varied.

Cassette has never really challenged vinyl's superior quality, but it is a multiple role format, offering 'go anywhere' flexibility, a uniquely useful recording capability, plus a broad catalogue of pre-recorded music cassette material. As a hi-fi medium cassette suffers from pre-recorded material which has been improving but is still patchy in quality, and can usually be bettered by a home recording. There is also the worry that a tape made on a specific machine usually replays best on that machine, which may cause aggravation when upgrading a few years hence. It is worth remembering that though such opportunities are rarely possible or practical, a live recording onto cassette using good quality microphones can be the hi-fi equal of any other source.

CD is the latest challenger to these two established media, using a digital instead of analogue storage format. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks, so it is probably fairest to say that CD is fine for most listeners, but may not suit everyone; certainly the lack of background noise, defects and deterioration over time are major strengths.

While there will always be arguments about the different music storage and transmission formats available to the hi-fi listener, there is also controversy over the relative importance of the different components which make up the system chain – by which is meant the source, the amplification, and the loudspeakers (and for the pedantic the room itself, though there's often little that can be done here).

For many years the 'weakest link' theory proposed that the loudspeakers needed the most attention, that amplifiers merely had to have sufficient power, and that turntables were pretty well perfect. However, this perspective has become steadily discredited by an alternative 'theory of precedence', which stresses that no subsequent component can make up for the inadequacies of its predecessors – all it can do is supply its own additional degradations. In such a context it is not uncommon to find more than half the system budget allocated to the record player, with scrimping and saving made on amplifiers and loudspeakers, even though these are used all the time whatever the source.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Good turntables and loudspeakers both benefit to a surprising degree from proper support – from stands that enable them to give their best performance, whether floor-standing or wall mounted.

Siting of components within a room can play a significant role, as can the room itself. Some people may prefer an acoustically more 'live' room than others, but most will agree that the larger it is the better, because this tends to provide smoother and better extended bass reproduction. All rooms create reflections and standing waves, and the effects of these are more severe if all opposing walls are parallel, similar distances apart, and with hard reflective surfaces. Provided that the loudspeakers can be placed fairly symmetrically, slight asymmetry elsewhere in the room is usually helpful.

The loudspeakers are most critical of placement, because it is their job to create the stereo image, and it will be impossible to do this if the sound from each is not roughly similar at the listening position. Each loudspeaker should operate in a similar immediate acoustic environment, unencumbered by other furnishings and structure, and a similar distance from listener, nearby walls, and corners. Some loudspeakers are designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers benefit from being closely mechanically coupled via proper stands to the floor.

There is some debate about the best form of fixing, however, adjustable spikes through to the

floor proper or seated into the tops of cross-head screws are generally regarded as the best solution in most circumstances. There is no need for paranoia about using spikes through normal pile carpets because the holes will be almost impossible to find when the stands are removed.

Most recent quality turntables are fairly immune to feedback from loudspeakers, so it should not matter too much if these items are sited fairly close to each other. Indeed it is debatable whether any advantages gained from keeping the turntable well away are not lost through the need to use longer connecting cables.

Mixing and matching the components of a record player to get optimum results can be something of a black art, over and beyond the fairly simple business of choosing a cartridge of roughly the right compliance to suit the arm effective mass. Certainly the combining of turntables and tonearms is not a simple matter, and this is where a good specialist dealer will come into his own, both in terms of recommending good combinations from the models he holds in stock, and then in correctly carrying out the sometimes tricky set up procedures which are often required to get the best results.

The key to getting the best results from a separates system lies in finding an experienced and skilled dealer in the first place, one who takes the trouble to find out what you really want and then demonstrate some likely alternatives, without trying to cram his own particular prejudices down your throat. To some extent the customer's task must be to discover for himself whether the dealer in question is competent or not. Membership of trade organisations like BADA can be a worthwhile pointer to a degree of professionalism, but the bottom line is whether the dealer in question can create a good sound in his own shop. If he can't, there is precious little chance of him doing so in your home. The best dealers should lay on demonstrations so you can hear the differences between components for yourself, and hear the sort of improvements which can be had at different price strata. You can then establish the sort of performance you are prepared to accept within whatever budgetary constraints you have set.

The Directory has been compiled so that it can be used by *Choice* readers as a buying guide. A guide in the sense that you should use the information in it to make a shortlist of equipment suited to your needs and budget, and then audition it at a dealers before taking the plunge. Because tastes inevitably differ it would be unwise to buy purely on the basis of our recommendation and dealers are the most experienced people around when it comes to making systems work as a whole.

THE DIRECTORY

TURNTABLES & TONEARMS

The schizophrenic split between consumer electronics and 'real hi-fi' is most obvious amongst turntables. The former are supplied simply as a means of playing vinyl in a system context. Cheaply manufactured in the Far East, these are complete players with a variety of automatic facilities, sometimes tied into system remote control. But engineering compromises severely limit sound quality, cartridge choice may be P-mount restricted, and such machines are rarely stocked by specialist hi-fi dealers these days.

Specialist turntables offer big sound quality

improvements, but lack so-called convenience features (that practised users often find irksome). Such turntables at the cheaper end of the market (sub-£350) tend to be supplied with matching tonearm, and often include a 'starter' cartridge. Still better quality is found at higher prices amongst the separate motor units and tonearms. Careful partnering and set-up is essential for these individual components, but 'naturally sympathetic' combinations do exist, and the good dealer can help.

Listed separately as integrated players and as turntable motor units and tonearms, our sound

quality rating is based on results achieved using a high quality system – but in point of fact the turntable is usually the limiting factor soundwise in any system. **Lab performance** summarises the speed stability, vibration generation and environmental isolation of turntables, along with the friction, alignment and adjustment of tonearms. The tonearm's physical characteristics also define a range of mechanically compatible cartridges (see cartridge listings).

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research EB101 £230	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Alphason Solo/Xenon MCS £365/£262	Average+ Good	The deck is warm and euphonious with high levels of clarity. Wow artefacts occasionally just audible.	3 point suspended motor unit, optional quartz PSU/speed change 13g		67
Alphason Sonata/HR-100S-MCS £720/£480	Excellent Very Good	Highly capable audiophile system with real resolution and control. Bass is powerful and dynamic ability unbridled	Manual, subchassis, belt drive, 10g	R	60
Ariston Q-Deck £150	Good Average+	Well engineered and good sounding low cost package which is both easy to set up and to use	Semi-auto, belt drive, solid	BB	67
Ariston 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	Stated as a replacement for the CS505, the 503-1 needs careful system matching to mask rumble and microphony, but is good enough to benefit from a better cartridge	Semi auto, belt drive, low mass arm	R	55
Dual CS505-3 £139	Very Good Good	Continuous steady improvements have kept this model at the forefront of the budget market. Practicality is excellent and the deck has excellent timing bass/mid and stereo imaging.	Semi-auto belt-drive, 8g	BB	67
Dual CS5000 £200	Average Average+	The rare 78 facility may give grandma's collection a new lease of life but the player did not merit recommendation on price vs sound	Electronic, belt drive, subchassis, 10g		48
Goldmund ST4 £4,550	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-FD555 £170	Below Average Poor	Clear midband sound but woolly bass and crude treble. Ease of use however ranks highly, and there's little to be out of adjustment	Auto, direct drive, 5.5g		67
Kenwood DP-99D £300	Average Average	Smart, slick and massive player suitable for low compliance cartridges only. A good but not inspired performer.	Semi-auto 2 speed direct drive, 16g		67
Kuzma Stabi/Stogi £575/£349	Average+ Stabi: Good; Stogi: Excellent	Stabi is powerful, spacious but not sufficiently subtle. Stogi is an excellent all rounder with even spread of abilities.	Manual, belt drive, subchassis. 12.5g	Stogi: R	60
Linn Axis £379	Good+ Good+	Setting new performance-for-price standards this cleverly engineered and competent deck has many of the qualities of the Sondek LP12	Electronic, belt drive, semi subchassis, 13g	BB	48/Coll
Linn Sondek/Ittok (Troika) £509/£429/£669	Excellent Excellent	Superb sound – the best LP12 combination yet. The Troika gives the system real solidity and strength, stretching the deck and arm qualities to the full	Manual subchassis player, belt drive, 14g	R	60
Manticore Mantra £325/£403 (Arm)	Good+ Good+	Fitted with a Rega RB250 arm variant and AT95E cartridge the Mantra fared very well indeed with a fine midrange and good focus	Subchassis, 12g, manual	BB	48/Coll
NAD512D £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, 9g	BB	67
Omega Point Silver/Black £895/£295	Good Good+	An avowedly stripped down turntable that lacks even an on/off switch, the Omega Point Silver offers fine midrange clarity and good stereo, but some HF compression and a lack of 'wellie'	Manual, solid, belt drive, unipivot, 11g		55
Opus 3/Decca London International (Revised) £399/£99	Poor Good	Heavyweight motor unit with many fine properties, but which needs further development. The idiosyncratic arm is a suitable (though not ideal) platform for the Decca cartridge. For all its faults though, the whole transcends the sum of the parts	Belt-drive manual, damped unipivot arm, 12g		67
Rega Planar 2 £155	Average+ Good	A remarkable product at the price, surprisingly articulate and confident	Integrated turntable, manual, 11.5g	BB	48
Rega Planar 3 £207	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	Average— 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
Roksan Xerxes/Artemiz/Shiraz £655, £450, £489	n/a Very Good	Imaginatively designed, sophisticated front-end system, a little drier than some perhaps, with superior stereo, resolution and presence	2-speed manual, MC cartridge, 9g	R	72
Sansui SR-222 Mk V £159	Average— Average	More than acceptable in most areas, the Sansui is detailed and positive, though a little muddled when stressed. Best suited to low compliance cartridges	Manual 2-speed belt drive, 16g		67
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 DD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48
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

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INTEGRATED TURNTABLES

HI-FI CHOICE

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INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
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
Zarathustra S4/Pluto 5A Prestige/PSU £1500/£2500/£500	n/a Excellent	The very well made and finished heavy platter S4 with the superb Pluto arm make a devastating combination ranking up there with the very best	Subchassis, manual, available without PSU	R	72

MOTOR UNITS

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
Michell Syncro £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 $\frac{1}{3}$ rpm		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 £1995	Very Good Excellent	This big, open and powerful sounding turntable works beautifully with Airtangent arm to give superb 3-D imagery	Manual, belt drive, subchassis, stand	R	60
Pink Triangle PT T00 £650	Good Very Good	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 Very Good	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Like all sophisticated decks, setting up is best left to a dealer	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
Systemdek IIXE £248	Good Very Good	Fine, honestly specified and well built player which easily betterers its closest stablemate, the IIX. Frankly, at the price it's a sonic bargain	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
Voyd "The Voyd Plus" £2,522	n/a Excellent	Based on the standard 3-motor Voyd but with upgrade options (better bearing, platter, etc) which take it half way to a Voyd Reference, so we've dubbed it The Voyd Plus. Superb build and finish; colourful, dramatic performance. A thoroughbred	Belt drive, 3 motors, subchassis, outboard PSU	R	72

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
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 outout	12.75g	R	55
Alphason HR100S £395	Good+ Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	48/Coll
Ariston Enigma £99	Average Average+	Good but not the best in its class: mid-band sounds a little uneven; treble a trifle "brash"	11.5g		48
Audio Technica AT1130 £186	Good Good	Well suited to most cartridges including high compliance ones, the AT is smooth and tonally neutral, if slightly lacking in "balls"	8.5g	R	67
Decca International £49	Average+ Average+	This uni-pivot design gives a rather rich tonal balance and some bass muddling. Could be good with Decca cartridges, but not well built	12g		48Summary
Eminent Technology £1000	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
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	Excellently engineered with rigid bearings, free from slack. It remains expensive but the level of performance deserves Recommendation	12g	R	48
Linn Ittok LVII £429	Very Good 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

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THE DIRECTORY

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Linn Ekos £895	Very Good Very Good	Superb, state of the art design which builds significantly on Ittok's strengths	9g	R	67
Mission Mechanic £900	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 £78	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 £115	Good+ + Good+ +	Despite its modest price this sets exceptional performance standards and could be used on a number of high-quality turntables	10-11g	BB	60
Roksan Artemiz £450	Average Good	Excellent but flawed arm which needs some development and refinement before it can be wholeheartedly endorsed. Watch this space. Fits Rega cutout	8g		67
SME 3009 Series IIIS £165	Good Average+	A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character	5g		48
SME 3009 Series III £229	Good Average+	Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges	5g		48
SME 3009R £291	Average+ Average+	A higher mass version of the Series III designed for low compliance MC cartridges	12g		48
SME Series IV £810	Excellent Very Good	Superb engineering and finish with a finely balanced sound giving impressive stereo focus and low coloration	10.5g	R	60
SME Series V £1206	Excellent Very Good	Excellent in terms of design engineering and sound quality, this arm arguably sets a new reference standard regardless of price	10.5g	R	60
Souther Tri-Quartz £895	Average Good	A unique parallel tracking arm that makes up for what it lacks sonically in its unusual appearance	3-4g		48

CARTRIDGES

Very much the 'slave' of turntable and tonearm and to some extent undermined by the supply of free 'starter' cartridges on many turntable systems, the cartridge is still worth taking seriously. The quality of both the stylus itself and the cartridge's tracking performance are important in preserving that most important part of the hi-fi system – the record collection – and the cartridge also plays a significant role in determining the overall balance of a system.

Cartridges fall into two groups: high output models, capable of working directly into any amplifier, and more expensive low output models. Stereotypically, low output cartridges use the moving coil principle of operation, have better mechanical integrity and tighter tolerances, and give better performance but at much higher cost. Most under-£150 amplifiers and many valve designs need either an extra head amp or transformer to cope with the low output. Cartridge/amplifier

interfacing can be very subtle, but even basic high output moving magnet designs benefit in overall balance from optimised amplifier capacitance loading. Still more important, the mechanical cartridge characteristic of cantilever compliance ('springiness') needs to be considered in the light of the effective mass of the tonearm which will be used (see Turntable & Tonearm entries).

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
A&R C77 £20	Average+ Average+	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal, MM	BB	48
A&R C77Mg £30	Average- Average	Punchy sound quality with plenty of extra energy to liven things up. The solid body seems well worth the extra £10	4-8g Normal, MM	BB	67
A&R E77Mg £47.50	Average Average	Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'	3-8g Normal, MM	R	48
A&R P77Mg £60	Average+ Average+	Cautiously recommended, the P77Mg was preferred to its cheaper partner by virtue of a better tip. Channel balance could have been better	4-9g Normal, MM	R	48
Audionote ID2VDH £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	R	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	BB	67
Audio Technica ATOC7 £250	Good+ Good+	The OC9 is better if you can afford the extra. But OC7 is at least a taste of the high-end at a sensible price	6-13g Low, MC	R	54
Audio Technica ATOC9 £400	Average+ Very Good	Tonal colours are reproduced faithfully and it rarely puts a foot wrong. Slightly less transparent than more costly MCs but it has got real wellie. Good value (really!)	6-14g Low, MC	R	60
Audio Technica ART1 £800	Good+ Very Good	This is a delicate and very fluid-sounding MC that tracks well, offers very low distortion and exceptionally good stereo separation	9-18g Low, MC	R	72
Azden YMT0VE £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
Azden GMP5L £108	Average+ Average+	Although no P-mount system will do this cartridge justice, it can still be enjoyed in its universal mode. The subtle balance may prove irresistible to some	4-10g Low, MC	R	54
B&O MMC5 £24	Average+ Average	Cheapest in the family – smooth treble and good focus, but the bass was left in the wings	5-15g Normal, MM		38 (Summary)
B&O MMC4 £43	Good Average+	Solid and well balanced in the midrange, the '4 lacks bass impact	5-15g Normal, MM		48
B&O MMC3 £57	Good Average	Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment	5-15g Normal, MM		48
B&O MMC2 £87	Good Average+	Only a modest improvement on its cheaper brothers (and sisters)	5-15g Normal, MM		48
B&O MMC1 £112	Very Good Good	Great clarity and detail at high frequencies but a slightly plodding bass. It may appeal more to the classical enthusiast	5-13g Normal, MM		48

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Cello Chorale £590	Average + Good	Now available through a new distributor at a saving of some £300, the Chorale is still blessed with a delicate but highly detailed treble. Arm matching is a problem	3-9g Low, MC		72
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 Signature £995	Average + Good	This latest MC to emerge from Clearaudio features yet another graded version of its proprietary generator. Its sound strikes a balance between the Delta and Prad	4-11g Low, MC		72
Clear Audio Pradikat £1225	Average + Very Good	Sounded absolutely glorious, creating a full sense of scale and a large well-focused soundstage – but watch for record wear	8-18g MC		Coll
Clear Audio Accurate £2,000	Good Excellent	A remarkable cartridge, not only by virtue of its effortless and highly neutral sound quality but also because this has been achieved with the same basic design as Clearaudio's cheapest MCs	4-11g Low, MC	R	60
Denon DL110 £69	Good Good	Firmly recommended as a fine all-rounder, this high-output moving coil model is likely to perform well in nearly all circumstances	6-16g Normal, MC	BB	48
Denon DL160 £89	Average + Good	Although listeners just preferred the 110 its brother here proved a twin in lab tests and is still "thoroughly competent"	6-16g Normal, MC		43
Denon DL 103 £99	Average Good	This classic spherical stylus model gives a lively sound with powerful bass, and is popular in broadcast studios	6-16g Low, MC	R	48
Dynavector DV-50X £60	Good Average	A high-output MC model with impressive lab performance, but whose tip and sound quality both disappointed	6-14g Normal, MC		48
Dynavector DV10X IV £60	Average Average +	Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability	8-18g Normal, MC	R	48
Dynavector DV23RS £150	Average + Good	Sound quality was described as "shut-in", lacking energy and sparkle but with some "edginess" in high frequencies	10-22g Low, MC		28
Dynavector DV XX-1 £360	Good Good +	The XX-1 embodies a power and solidity rarely encountered amongst the breed, nevertheless it did exhibit a peculiarly suppressed character that will suit lively rather than wholly neutral systems	7-17g Normal, MC		60
Empire 800 Mk II £33	Good Average	This very high output MM appears to be based on the classic Ortofon VMS series. A trifle uninspiring overall	7-17g Normal, MM		67
Empire MC-5M £110	Average + Good	A very low compliance renders this MC best suited to heavy tonearms while its sweet, non-aggressive sound quality earns it a recommendation	13-20g Low, MC	R	67
Empire Benz Micro MC-2 £600	Average Good +	Similar to both the Empire MC1000 and vdH MC2 in design, the Benz offers a warmer and very transparent account of the music. Its tracking prowess is slightly limited	5-12g Low, MC	R	72
Glanz 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 hagglng 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 + Very Good	Something of a mixed bag overall, its sonic character bears a strong resemblance to the Pradikat though it shares some of the hallmarks of the more expensive Accurate	5-12g Low, MC		60
Goldring 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 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, a good cartridge, in fact – but a bit pricey	8-16g Normal, MC		43
Goldring Excel £500	Average + Good	Goldring's most expensive cartridge to date errs on the warm and heavy side of neutral. Strong bass lines are its forte though its ability to resolve subtle treble details is weaker	6-13g Low, MC		72
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 + 1 £22.50	Average – Average	Bass and treble are a trifle coloured but the midband proved highly enjoyable. Ideal for budget systems	6-13g (damping) Normal, MM	R	54
Grado XF3E + £43	Average – Average	Downtilting balance disguises the brightness of this cartridge; bit of a mixed bag at this price	9-20g (damping) Normal, MM		54
Highphonic MCA3 £360	Very Good Good +	Exquisitely crafted by a group of ex-Denon engineers, this superb tracker had a sweet and seductive (if rather bright) treble	5-12g Low, MC		43
Kiseki Blue Silver Spot £395	Average + Good	Solid performance from a very solid cartridge but lacks some of the magic of other Kisekis. Compliance too high	5-12g Low, MC		54
Kiseki Purpleheart Sapphire £695	Good + Good +	Rare, beautiful to look at and sweet to listen to, our review of this high-flyer conjured up images of Japanese art	5-14g Low, MC		Collection
Kiseki Blackheart £1595	Good Good	This cartridge demonstrated refined poise and a delicate but at once potent security, however, the price did seem a little on the high side compared to other Kisekis	6-16g Low, MC		60
Kiseki Lapis Lazuli £3500	Good Very Good	Combining very sensible design concepts at a silly price, the Lapis Lazuli is best thought of as combining the detail of the MC3000 and the fluidity of the Clearaudios	4-12g Low, MC		60
Koetsu Black S £599	Average Good +	The S is an OEM design built to Koetsu's blueprint. It features a sturdier fixing plate and offers a brighter, faster and more tactile sound than the earlier K	8-15g Low, MC	R	72
Koetsu Red £896	Good + Very Good	Named like a rare, and perhaps dangerous, little oriental fish this famous cartridge sounded "almost larger than life"	10-25g Low, MC	R	48/Coll
Koetsu Red Signature £1391	Good Excellent	Technically this cartridge suffers no faults whilst on a subjective level it offers rare musical insight	10-21g Low, MC	R	60
Krell KC-100 £700	Average Good	Apparently based around a similar generator as the Cello Chorale, the Krell provides a similarly light and airy sound. Low mass arms with damping are best used	3-9g Low, MC		72

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Linn K5 £30	Average Average+	Not as crisply focused as the costlier Linn magnetics, the K5 offers a smoother presentation	7-16g Normal, MM	R	67
Linn K9 £75	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
Linn Asaka £299	Good+ Good+	Disciples of Linn who are trying to realise their true "Karma" may find that saving money is not a short cut to heaven	9-18g Low, MC	R	48/Coll
Linn Karma £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
Linn Troika £669	N/A Very Good	Ex-Karma users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a Troika	8-18g Low, MC		Coll
London Maroon £109	Average Average+	Now manufactured under the London brandname this Decca cartridge is as iconoclastic as ever	9-20g (damp) Normal, MM		67
London Super Gold £248	Average- Good+	Sometimes a bit fierce in emphasising record surface faults, it is perhaps best at revealing the excitement and tension in music	8-20g + damping Normal, MM	R	48/Coll
Madrigal Carnegie One £685	Average+ Good	Looks like a duck but sounds much better, certainly worth auditioning. Compliance too high	5-11g Low, MC		54
Milltek Aurora £198	Good+ Good+	An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge	8-16g Normal, MC	R	48/Coll
Milltek Olympia £298	Average+ Good+	Warm and detailed sound - packs the punch of the best MCs with high output as a bonus	12-20g (damping) Normal, MC	R	54
Mission 773HC £150	Good Good	A sufficiently well-balanced and competitively priced "old-timer" which still warrants recommendation	6-16g Low, MC	R	38
Monster Alpha 2 £479	Good Good+	In the final analysis this fine allrounder is insufficiently exceptional in any specific respect to justify fully its high price	6-14g Low, MC		Collection
Nagaoka MM4 £8	Average- Average-	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal, MM	R	54
Nagaoka MP10 £17	Average Average	High frequencies sounded "shut-in" with this spherical-stylus model, but mid and mass were energetic, bouncy and punchy	5-13g Normal, MM	R	48
Nagaoka MP11 Boron £38	Average Average+	Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations	5-13g Normal, MM	BB	48
Nagaoka MP10SB £40	Average Average+	Stilton's mods have improved the fine detail resolution of this popular budget model	5-15g Normal, MM	R	54
Nagaoka MP11 Gold £45	Average- Average+	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal, MM	R	48
Nagaoka MP11 Gold SB £70	Average- Average	Excessive price loading for a blob of aluminium	2-6g Normal, MM		54
Ortofon OM5E £15	Average- Average-	The OM10 is a hi-fi cartridge - the OM5E is not	5-16g Normal, MM		43
Ortofon VMSSE II £14	Average Average	Sound quality was thought fair for the price, though a little 'untidy'	8-18g Normal, MM		38 (Summary)
Ortofon OM10 £20	Average Average	One of the leading "cheapies", this gives a fine level of sound quality for the price, with good matching compatibility	5-15g Normal, MM	BB	48
Ortofon VMS 10E II £21	Average- Average-	Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot	Normal, MM		38
Ortofon VMS20E II £35	Average Average	One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better	3-10g Normal, MM		48
Ortofon OM20 £40	Average Average+	This turned out to be the listening panel's favourite among Ortofon's moving magnet models	5-16g Normal, MM	R	48
Ortofon 520 £50	Average Average+	Very sensitive to load capacitance this new Ortofon maintains the company tradition for a lively, effervescent SQ	7-16g Normal, MM	R	67
Ortofon X1 £50	Average Average	The cheaper X1 scored higher marks with our listening panel than the X3, but both were a disappointment	6-15g Normal, MC		48
Ortofon VMS30E II £52	Average+ Average	Rather an old soldier in relation to turntable technology, it will perform undemandingly in demanding circumstances	5-13g Normal, MM		38
Ortofon MC10 Super £70	Average Good	"What a delightfully sweet-sounding cartridge this is..." we said	5-15g Low, MC	BB	48
Ortofon X3 £70	Average Average	A lack of bass power, definition and a "zitty" top end makes this competent but uninvolving	5-15g Normal, MC		48
Ortofon OM40 £80	Average Average+	Highly competent engineering, secure tracking and decent sound quality are major strengths. But it's a little cold, a little polite	3-8g Normal, MM		48
Ortofon 540 £100	Average- Average	Graced with an advanced FG11 stylus our sample possessed too high a compliance for broad arm matching. It could also sound a little unforgiving	3-8g Normal, MM		67
Ortofon MC20 Super £170	Average+ Good+	An "inviting" sound quality; polite rather than exciting it approaches much more expensive models, but does not better them	6-15g Low, MC	R	48/Coll
Ortofon MC30 Super £250	Very Good Good+	Beautifully engineered and well-balanced, it was slightly criticised as bland, though some may appreciate the lack of rough edges	5-14g Low, MC		Coll
Ortofon MC3000 £800	Good Excellent	Quite simply, the most accurate transcription device yet created - not one for the faint hearted	6-16g V. Low, MC	R	60
RATA RP20 £22	Average- Average	Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation	6-14g Normal, MM	R	48
RATA RP40 £44	Average Average+	The '40 did a good job of sorting out the layers and complexity of the mix, with good focus, excellent stereo spread and fine scale	6-15g Normal, MM	R	48
RATA RP70 £77*	Average Average+	Clearer and sweeter than the '40 this also seemed heavier and less lively. For £99 you can have a van den Hul stylus	6-14g Normal, MM		43
RATA RP70vdH £99	Average+ Good	Able to retrieve bags of musical detail (thanks to the vdH stylus), RATA's top cartridge ranks as one of the most articulate MM's available	11-18g Normal, MM	R	67
Rega Bias £34	Average Average+	Difficult to mount in some arms due to its shallow build, the bias offers a gentle, refined SQ that certainly makes it worthy of audition	4-10g Normal, MM		67
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

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
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, but giving no substantial improvement over the 92E in our view.	5-15g Normal, MM		38
Shure ME97HE £44	Average Average +	It won't turn a sow's ear of a turntable into a silk purse, but will at least keep going and produce an acceptable result.	8-20g Normal, MM	R	48
Shure 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 no doubting the accomplishments of what could well be the finest moving magnet cartridge around.	6-14g Normal, MM		48
Stilton/AT-F3 £110	Good + Good +	At a premium of some £40 this modified AT-F3 offers a startlingly refined performance and is strongly recommended.	8-18g Low, MC	R	67
Supex SM100E £115	Average Average +	Delivers as much musical information as many moving coils - the bass in particular having an attractive bounce.	6-15g Normal, MM		38
Supex SD900IV £350	Average + Good +	The 900 is an inherently fine cartridge, but despite a recent update it is beginning to show its age.	10-18g Low, MC		48/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 £699	Good Very Good	This extended all the positive qualities of the '10 but added greater authority and scale - worth it for the extra money.	6-12g Low, MC	R	60
van den Hul MC Two £899	Good Very Good	Connected directly to any standard MM input the vdH MC Two rewards with a highly detailed yet fluid and musically convincing portrayal.	6-13g Normal, MC	R	72

* rating refers to original tested model

AMPLIFIERS

The amplifier sits at the heart of the system, processing the outputs from all the various music sources as necessary and then driving the loudspeakers. These two (quite separate) functions are integrated into a single box at the low-to-middle price points; separated pre- and power amplifiers become increasingly common as one moves upmarket. At the upper-end of the specialist market, valve amplifiers provide a popular alternative to the transistor types amongst enthusiasts.

There is a substantial difference between specialist (sound quality oriented) amplifiers and the consumer electronics style models. The former

are bleakly simple, avoiding all unnecessary features to provide the most direct signal path in the interests of best sound quality. The latter range from models with just basic tone controls and tape recorder switching, to those with elaborate facilities such as graphic equalisers, remote control (including volume), surround sound options etc. etc.

Lab measurement provides some useful data, particularly in regard to an amplifier's ability to drive a wide range of different types of loudspeakers, but this is only obliquely related to sound quality. We also include our measured power output (RMS, 8ohm load, 1 channel driven) - but

again, paradoxically, this doesn't necessarily correspond to the loudness capability of the amplifier, which has as much to do with the elegance of the overload characteristics within a given system (valve amplifiers invariably sound more powerful than their rating would suggest). The listing of features provides some indication to the complexity of an amplifier: many users prefer to retain the option of tone controls to 'shape' the overall sound according to taste; many others have found living without tone controls surprisingly easy, with additional benefits in terms of transparency.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research A03 £160	Average + Average	New slimmed down version of the A04 with less power and facilities but also a slightly 'fuzzy' sound.	38W, MM disc, CD direct and 3 aux inputs		74
Acoustic Research A07 £280	Very Good Average +	Relatively smooth but ineffectual sound quality that lacks some weight and impetus at very low frequencies.	75W, 4 line, 2AV and MM/MC inputs		68
ADC A-2080E £400	Good + Average +	Clean and neutral sound but one that lacked depth and spaciousness; MM input favoured above MC or CD.	108W, logic sw. for 5 line and MM/MC inputs		68
Akai AM-52 £230	Average + Average -	Basically equipped, this amplifier offers a comfortable but hardly over-detailed sound.	95W, MM/MC disc, 5 line inputs, loudness		74
Akai AM-93 £550	Average Average -	Unfortunately Akai's on-board D/A converters were less successful than its conventional analogue CD input.	112W, coax and optical dig inputs, MM/MC		68
A&R Arcam Alpha II £170	Good Good +	Very confident, convincingly musical and punchy sound that sets the standard for other budget amps.	41W, 4 line and MM inputs	BB	68
A&R Arcam Delta 60 £260	Good Good +	Very refined and highly detailed sound via MM and CD without any of the hardness noted via the MC stage.	59W, 4 line, MM/MC inputs, no tone controls	R	68
Albany M408 II £895 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
Albany M1008 II £1095	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
Amadeus Gold £360	Average - Good	There is some indication of instability but otherwise sounds very rich, warm and musical. High-ish IMD.	56W, MM/MC plug-in cards, 3 line inputs	R	74

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Analogue Electronics PR3/PA4 £280/£280	Poor— Fair	Our samples, though certainly not prototypes, were technically compromised. Preamp sounds very bass light while the power amp sounds very coarse	29W, MM/MC, separate source and record out, recessed 4mm sockets		74
Aragon 4004 £1795	Good Good	Despite its imposing bulk the Aragon is something of a softy at heart. It can deliver oodles of power but its musical presentation is more laid-back	231W power amp		72
Arcam Delta 90.2 £350	Average+ Average+	Dark but slightly dead or conservative sounding version of the original Delta 90. Improved disc stage	73W, MM/MC, 4 line inputs, tone bypass, bi-wire	R	74
Ariston Amp £180-200	Average Average+	Slightly veiled and thin sound but proved suitably attractive in the listening tests	32W, full logic control, MM and 4 line inputs	R	68
Audio Innovations Series 300 £425	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 £1299/2250	Poor Excellent	This valve combination offered awesome dynamic range with superb transparency and power to match. Compatibility with other brands is unpredictable	15W, MM, 6 inputs, monobloks	R	63
Audio Research SP9 £1698	Very Good Very Good	This new high performance valve FET hybrid preamplifier sets a high standard for versatility, build quality and sound	5 inputs, MM/MC	R	60
Audio Research SP11 II £5250	Very Good Excellent	Current state of the valve preamp art. A reference point	Straight line MM/MC Disc + phase invert	R	60
Audiolab 8000C £325	Excellent Good	A well established preamp with a highly controlled sound, though it could do with more life and depth	MM/MC, 5 inputs, hdph, tone controls	R	62
Audiolab 8000A £350	Very Good Good+	Exceptionally detailed, tactile and transparent via CD but slightly more clouded via disc. A stalwart design	72W, MM/MC, 4 line and full record out selection	R	74
Audiolab 8000P £495	Excellent Good+	A dynamic powerhouse, load tolerant and sonically reliable	100W	R	62
Beard Audio CA35/P35mkII £595/£795	Fair+ Very Good	Good build quality and a very smart finish combine with a characteristic valve sound to make a first class amplifier capable of giving hours of musical enjoyment	35W, MM/MC, 4 inputs	R	63
Beard 506 £1195	Good+ Good+	A versatile valve preamp – the bass sounded lively if a touch softened while the treble was detailed but lacked a little sparkle and air.	4 inputs MM/MC		50
Beard M70 £1995 pair	Good Good+	A substantial British monoblok power amplifier, but not a great deal more impressive than the P35 at half the price	70W		50
Bryston 0.5B/2B £595/£695	Very Good Good	Very rugged Canadian pre/power combo that sounds cool confident and punchy. Headamp available to suit MC cartridges	65W, MM and 4 line sources, overload LEDs on power amp	R	74
Bryston 12B/4B Pre/Power £995/£1395	Good+ Good	Bryston's massive 4B power amp stood out as the backbone of this combo, the preamp sounding a trifle unbalanced between MM and MC inputs	272W, bridgeable to 800W. 6 line, 2 disc inputs, subsonic filter		68
Cambridge Audio P40 £200	Good Good+	A very fine sounding integrated amplifier with simple facilities and MC cartridge capability	5 inputs 40W MM/MC straight line	BB	50
Cambridge Audio C75 £279	Good+ Good+	Whilst not quite on par with its A75 companion this preamp provided excellent stereo imagery but was a touch "heavy" in character	MM/MC disc	R	50
Cambridge Audio P55 £290	Very Good Very Good	A grown up P40, the P55 suffers slight noise on the moving coil input but offers great sound for the money	55W, MM/MC, 5 inputs, hdph	BB	62
Cambridge Audio A75 £299	Very Good Very Good	This strong power amplifier sounded open and effortless, with fine bass drive and dynamics, albeit a touch grainy and harsh at high frequencies	100W	R	50
Cello Audio Suite £5280	Excellent V Good/Excellent	Cello's preamp represents a whole new ball game in flexibility and sound quality (or war of attrition on your wallet)	Optional inputs MC etc	R	50
Conrad Johnson MV50 £1699	Good+ Good+	Coupled with the PV5, this CJ power amp performed well on audition	50W		Collection
Conrad Johnson Motif MC-8 £1995	Very Good Very Good	A cheaper alternative to the '7, this preamp is an undoubted success in maintaining the Motif sound but does not compare on sound quality	MM/MC	R	50
Conrad-Johnson Premier Seven £8995	n/a Excellent	Price has increased since we tested it – but at this price who cares? The 'Seven is designed without compromise, and it's clearly one of the finest (valve) preamplifiers money can buy. Absolutely gorgeous!	MM, 4 line inputs, sep. Rec Out, versatile cartridge matching	R	72
Counterpoint SA12 £1250	Good+ Good+	A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes	100W		Collection
Creek CAS 4040 S2 £179	Good Good	More neutral than its predecessor tonally, substantial improvements in transparency were also noted, while the lively punchy character is retained	30W, MM, 4 inputs, tone controls	BB	62
Creek CAS 4140 S2 £219	Good+ Good	Redesigned for '88, this is a fine allrounder with good moving coil input, plain presentation	40W MM/MC 3 line inputs	BB	62
Creek CAS-5050 £399	Average Good	Strong RF IMD compromises the sound of the CD input which contrasts with the delightful performance via MM/MC	72W, MM/MC, aux CD and video + pre/power mode	R	74
Croft Micro £150	Average+ Good	A real upsetter, this excellent valve preamp put the cat among the pigeons proving good sounds can be made at budget price levels	4 inputs MM straight line	R	Collection
Croft Super Micro A £500	Average+ Very Good	The looks are somewhat improved, while this 'hot rod' version with tuned components performed very well indeed. There is still no gain on the line inputs	4 inputs, MM, straight line	R	57
Croft Series IV(S) £730	Good Good	The original IV is still available now supplemented by the higher price and power (S); both are fine performers	40(60)W channel	R	57
Croft Series IVSA £1000	Good Very Good	Featuring tuned components chosen for their sound quality, the 'A' variant is an impressive example of Croft's technique in valve design	60W special supply regulation	R	57
Deltec DSP-50S DPA-50S Pre/Power £675/£825	Excellent Very Good+	Remarkable pre/power combo based around the highly linear DH-0A32 hybrid op-amp. Unmatched detail resolution control and transparency	63W, external feedback wiring. 3 line, MM/MC no tone controls	R	68
Deltec DPA 100S £2200	Very Good Very Good	A top-quality transistor power amp, sounding fast, articulate and well controlled, though maybe a touch clinical for some tastes	80W	R	50
Denon PMA 250 II £125	Good Fair	Despite a claimed increase in power this competent model now slips behind the competition on sound quality grounds	30W, MM, hdph, tone controls		62
Denon DAP-2500 PDA-4400A Pre/Power £549/£599 pr.	Very Good Good	Denon's fully-fledged preamp also incorporates D/A converters that did not improve the sound of our £299 CD player. The power amps are brilliant!	172W, monobloks Opt/Coax dig + 2 tape, 4 line and MM/MC inputs		68
Denon PDA-6600 £1,000/pair	Excellent Very Good	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles	250W monoblok, remote power	R	60
DNM 3A From £1000	Good+ Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R*	44
E.A.R. 802/509mkII £920/£1550	Average Very Good	Extremely well made and combining the sonic strengths of both transistors and valves this EAR combo warrants attention	100W, MM, 6 inputs, monobloks	R	63

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
E.A.R. 549 £3,000/pair	Very Good Very Good	A valve monoblok that measures like a solid state amp is itself an achievement, but exceptional power delivery and bass 'slam' is not fully matched by delicacy and transparency elsewhere	200W monoblok, bias setting		60
Exposure VII/VIII £360/£340	Very Good Good	Supplied as a combination without the separate preamp power supply, this pre power combination performed satisfactorily especially on the moving coil input	50W, MM/MC, 3 inputs, straight line		62
Exposure VI/VII Dual/VIII Pre/Power £449/£219/£379	Good Very Good	An established company like Exposure could do more to improve the 'look' of these amps which, nevertheless, sounded confident, dry and musical	63W, Super mod. 4 line and 2 disc inputs with full rec-out switching	R	68
Grant G60AMS £948 pr.	Good Very Good	This neat and compact 60W valve monoblok gave good sound on the 8ohm tap, better still on 4ohms. The midrange was particularly natural	60W monobloks 8ohms	R	57
Grundig A-9000 £650	Good + Average -	Very large integrated design culled from Marantz, however is far too expensive to be fully competitive	153W, MM/MC, full record out selection		74
Hafler DH120 kit form £325	n/a Fair	We didn't build one; see below	60W		44
Hafler DH-110/XL-600 £360/£395	Very Good Very Good	Preamp is available in kit form. Both sound remarkably open, transparent and inherently 'musical'. XL-600 is tremendously powerful and very compatible	426W in stereo mode, 1.5kW in bridge, 2mm, tone + processor loop	R	74
Hafler DH120 assembled £396	Very Good Fair	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W		44
Harman Kardon PM635i £159	Good Good	An improved version of the classic PM635 amp which sounds typically dry and articulate. Price is frozen	49W, 4 line and MM inputs A/B speaker o/p	R	68
Harman Kardon 640 Vxi £225	Good + + Good	Moderately priced but built to HK's high standards; good value and good load tolerance	50W MM, 5 line inputs tone controls		56
Harman Kardon PM645Vxi £300	Very Good Good	Fits in well with the Harman Kardon series, giving a competent all round performance at a fair price	75W, MM/MC, 5 inputs, hdph, tone controls		62
Harman Kardon PM650Vxi £369	Average + Good	A tight and slightly over-damped sound lacks any essential warmth or richness. Reduced headroom on MC	71W, 6 line, MM/MC and true A/V inputs		68
Harman Kardon 655 Vxi £449	Very Good Good	Plenty of well built integrated amplifier for the money, with lots of power to drive almost anything, plus versatile inputs	100W MM/MC 6 line inputs tone controls		56
Harman Kardon Citation 25/22 £599/£859	Good Average +	Not as outrageous as previous Citation amplifiers but neither as punchy nor exciting in the sonic stakes. A good all-rounder but lacks sparkle	138W, MM/MC full range of input and record out		74
Harman Kardon PM665Vxi £699	Good Good	A versatile and meaty amplifier with high current capability, but sound quality lags behind certain home grown alternatives	150W MM/MC tone controls (switchable)		60
ITL MA-80 £169	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 £7,425	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
Jeff Rowland Coherence One/Model 7 £3750/£4950 each	Very Good Very Good	The technical design of these amps is very elaborate but ensures they achieve an extraordinarily transparent and potent sound. However, the CD i/p is clearly superior to the disc inputs	448W monoblok MM/MC with variable loading options. Balanced topology	R	72
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 Absolute Zero/M30 £395 + £295/£595pr.	Good + Average +	Latest versions of the M30 offers a true 30W Class A and a slightly muddled but very comfortable sound. MC preamp is a very linear design	33W monoblok MC only + 4 line inputs. Separate L/R balance	R	74
Kenwood KA-550D £120	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
Kenwood KA-501D £210	Good Good	Offers a slightly bass-light but very smooth, fresh and alive sound. Well built and sensibly equipped	101W, MM/MC, CD 3 tape, tuner, aux + direct	R	74
Kenwood KA-701D £300	Average + Average +	More powerful version of the 5010 but less successful in the listening tests. RF IMD is the likely cause.	123W, as above plus -20dB mute facility		74
Klyne SK5a £2590	Very Good Very Good	Beautifully made and presented this American thoroughbred has a good lab performance, but although versatile, is rather expensive for the quality of sound offered	Balanced output, versatile cartridge loading		72
Krell KSA-200 £5050	n/a Very Good	Value derives partly from excellence of sound, but equally from imperturbability, flexibility, consistency, build and after sales care	200W	R	72
LFD £2,995+	Very Good Excellent	Can set the subjective standards that others merely aspire to, but this outstanding if unconventional multi-box preamp needs careful matching to ancillary components (cartridge, power amp)	MC (with care), passive line extra	R	60
Linn LK1/LK280 Pre/Power £495/£645	Good Good -	A very modern, logic-controlled amp with distinctive and inoffensive sound quality. Its restrained sound could do with extra insight and zip.	84W, compact amp CMOS sw. for 2 tape, 2 line and MM/MC. XLR sockets.		68
Marantz PM25 £129	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 £149	Very Good Good	This new generation Marantz is a good allrounder, and shows that extra care is being taken over sound quality; well equipped and versatile	45W MM/MC 3 line inputs tone controls		56
Marantz PM45 £200	Good + Fair	Generally pleasant and polite with above average clarity; there was some softening in the bass, restricting dynamic output somewhat	40W MM/MC tone controls		50
Marantz PM-65AV £250	Average + Fair	One of the few amps to actually sound worse via CD direct! Unbalanced character but packed with AV inputs	82W, MM only wide range of aux/video		74
Marantz PM-75 £449	Good Average	More successful than most amps with on-board DACs but still not as balanced as other Marantz products	136W, opt/coax dig inputs, 6 line + MM/MC		68
Marantz PM94 £1,000	Very Good Good	At 23kg the PM94 is no lightweight in either physical or sonic respects. A very powerful and comprehensively equipped amplifier	140W MM/MC tone controls (switchable)		60
Marantz PM-95 £1,900	Very Good Average +	Beautifully constructed, this amp was less convincing via its digital i/p than via line. Class A option best suited to sensitive speakers. Costly	151W with 30W available in Class A. Opt + coax inputs		74
Meridian 201/205 £599/£425 each	Very Good Good +	A fine preamp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R/—	62
Mission Cyrus One £180	Very Good Good	A red hot class winner, which caused the whole issue to be re-rated! It's even well built - however, the headphone socket will only take a 3.5mm jack	30W, MM/MC, 5 inputs, hdph, straight line	BB	62
Mission Cyrus PSX £230	Very Good Very Good	The PSX does make the Cyrus Two sound better, and also improves the PCM II CD player giving more wallop and clarity	Auxiliary power supply	R	62
Mission Cyrus Two £300	Very Good Very Good	Also a top performer in its group with fine moving coil and compact disc sound. Again, only 3.5mm headphone socket	50W, MM/MC, 5 inputs, hdph, straight line	R	62

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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 line inputs straight line	BB	62
Musical Fidelity 3A-X/ MA100-X £379/£1,499pr	Average Very Good	Power amps get extremely hot as a result of Class A operation. Sounds exceptionally rich, lush and effortlessly musical. Lacks transparency	105W, MM/MC + 4 line inputs, passive line out bi-wire option	R	74
Musical Fidelity Pre 3/P140 £379/£349	Very Good Very Good	Delivering true audiophile sound quality well ahead of their price, both components shine in their own right	70W MM/MC 4 line inputs straight line	R	56
Musical Fidelity A100 £459	Good+ Very Good	This is another one recommended for fine sound with which you could keep your Chinese carry-outs warm	50W MM/MC 5 inputs straight line	R	62
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 Very Good	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 & A370 £2300/£2299	n/a Excellent	In its latest guise, the A370 confirms its status alongside the MVX as amongst the best indigenous components for both sound and presentation	MVX - MM/MC/4 line/phase invert. A370 - 150W	R	72
NAD 3020e £130	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 3225PE £150	Average+ Average+	Light and detailed if not as rich or weighty sounding as others. MM input sounds warmer than CD	42W + 70W dyn. headroom, soft-clipping, MM only	R	68
Naim NAIT 2 £322	Average+ Fair	Well built with good load tolerance the NAIT delivered a fully competitive sound in spite of its modest measured power output. Recent modifications as yet unchecked	15W pc MM 3 inputs	R*	50
Naim Separates £560-c£8,000	Very Good Good	A consistent and coherent series of 'building blocks' for conventional passive or active operation. Sound quality ignores conventional audiophile standards of presentation, but achieves fine musical communication	40-70W, MM/MC etc	R*	60
Nakamichi CA-5E £750	Very Good Good	A fine lab performance and high build quality but rather disappointing sound quality for a preamp of this price	MM/MC, 6 inputs, hdph, tone controls		62
Nakamichi PA-5E £1150	Very Good Good	A strong sound in several respects but one which ultimately failed to satisfy	100W		62
Nakamichi CA7E/PA7E £2500/£1700	Very good Good/Good+	Exceptional build and finish, plus good general performance, remote control and versatility, but expensive	200W MM/MC 6 line inputs, remote, tone controls		56
Nuance £795	Very Good Good	A subtle civilised pre-amp though a little lacking in resolution and detail; suited to some tastes but not top-drawer	4 inputs MC		50
NVA AP30mc £290	Average+ Good	Utilitarian in appearance but offers a very refined and beguilingly musical sound quality on MC and line	22W only. MC or MM options, 3 line inputs	R	68
Oakley Image £425	Poor Very Good	An interesting valve preamp from Yugoslavia, the Image on first impression needs a bit of tweaking to warrant <i>Choice</i> commendation but is a nice product nonetheless	MM, 5 inputs straight line		63
Orell SA-040 £359	Good Good+	This promising newcomer from a brand new company sounded pretty good and should improve as production settles	45W MM/MC, 4 line inputs, straight line	R	56
Philips FA-880 £200	Good Average	A new and cheaper design from Philips that sounds best via MM disc. Can appear soft and unbalanced via CD	108W, MM/MC source-direct tone		74
Philips FA960 MkII £299	Good+ Average	The MkII '960 still failed to grasp our listeners' attention but it remains a competent amp nonetheless	122W, 6 line & 2 disc inputs + tone controls		68
Philips DFA-888 £300	Good Average	As above but including a modified disc input and onboard DAC. Sounds tight but also slightly thin	107W, as above + opt and coax digital inputs		74
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
Proton 520 £100	Average Average	Very well equipped budget amp with a slightly flat and undynamic sound - acceptable at the price though	31W, MM/MC with variable MC gain, 4 line inputs	R	74
QED A240 CD II £169	Good+ Good	Latest 240CD is fine value for CD and has competent MM disc input as well	45W MM 5 line inputs straight line	BB	62
QED A240 SA II £219	Good+ Good+	Redesigned 240SA represents a significant allround improvement over its predecessor, and provides a good moving-coil disc input in a competitive price	45W MM/MC 5 line inputs straight line	BB	62
QED A270 £329	Good- Good+	Building on the strengths of the '240, the '270 sounds weighty, fast and dynamic. A bit 'lumpy' via MC	51W, 5 line and 2 disc inputs, pre-out	R	68
Quad 34 £285	Very Good Fair	This well-built durable preamp has useful filtering and above average tone controls but was found lacking in sound quality (viz: detail/dynamics)	4 inputs MM/MC tone controls		44
Quad 405 £349	Very Good Fair	Not an impressive power amp but easy on the ear if not pushed and very reliable	100W		44
Radford SC25 £862.50	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 £977.50	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 £1115.50	Good Good+	Offering superb midrange performance if not quite as good at the extremes, the Renaissance valve power amp is a genuine audiophile product	25W	R	50
Revox B150 £875	Very Good Average+	Beautifully constructed but hampered by Revox's convoluted logic control. Open and smooth sound. Still costly.	117W, CMOS sw. for 3 line, 2 tape and MM		68
Revox B250 £1188	Very Good Good	With much improved sound over its predecessors plus amazing remote control facilities, this could form the heart of a round-the-dream-house system	150W MM/MC system/house remote tone controls		56
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, hdph, 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

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Rotel RB/RC850 £150/£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 £170	Very Good Good	The latest upgrade is not that impressive, but the BX remains a fine amplifier and now has a moving coil disc input	30W, MM/MC, 5 inputs, hdph, straight line	BB	62
Rotel RC-870BX/RB-870BX Pre/Power £199/£210	Excellent Good +	Reduced price makes the 870 combo better value but, despite mods to the preamp, it is the power amp that must take the lion's share of credit	128W or 208W in bridged mode. CD direct, 4 line, 2 tape and MM/MC	R	68
Rotel RA840BX3 £220	Very Good Good +	Requires a very long warm-up period but rewards with a refined sound that should suit 'lively' systems	59W, 2 tape, 2 line, MM/MC and A/V inputs	R	68
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
SAE P102/A202 £499/£599	Average + Average +	Microprocessor-controlled pre and power amp that sounds much better at low rather than high volume levels. Pro-oriented aesthetics	151W, MM/MC + CD tuner and 2 tape tone memory, spk switching		74
Sony TA-F200 £130	Average - Average	Over-ambitious protection circuit is hardly in keeping with modern amp design. Lean but 'dead' sound quality.	74W, 2 tape, 3 line and MM/MC inputs		68
Sony TA-F400 £200	Good Average +	Some lack of integration across the frequency range but still offers a more open and detailed sound than the 'F200	76W, 2 tape, 3 line and MM/MC inputs. Rec-out		68
Sony TA-F530ES £300	Good Average +	Chunky UK-oriented design that offers a rich, smooth and full sound. Slight loss of focus via MM/MC disc	120W, MM/MC, 4 line sources + record out + tone	R	74
Sony TAF 500ES £349	Good + Fair	Not too hot at the price, lacking in bass action, rating poorly on vinyl, and only marginally improving on CD	75W hdph tone controls MM/MC		50
Sony TA-F630ESD £350	Good Average	Based on the '530 but equipped with PDM D/A convertor. Amp is competent but DAC sounds truly magnificent!	130W, as above + opt. and coax digital inputs	R	74
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
Sumo Andromeda £1585	Very Good Very Good	Well made with lots of power from a sensibly sized box. It was good in the lab and demonstrated a sound which offers a fine blend of performance at an almost reasonable price	200W, balanced input	R	72
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
Technics SU-V660 £250	Good Fair	Chunky build but integrated output stage infers a weak, insubstantial and rather monophonic sound	107W, MM/MC, CD aux, tape + tuner + power amp-direct		74
Technics SE-M100 £550	Very Good Good +	An unusual disc-less poweramp with volume control. Standard line input sounds very open and clean. Digital input is harsher and less convincing	123W, coax and opt digital inputs, var and direct CD no MM or MC disc	R	74
Vacuum State FVP £999	Good Very Good	This well thought out valve preamplifier is designed for optimum musicality and transparency, a goal which is handsomely achieved	5 inputs, MM, straight line	R	57
Yamaha AX-300 £100	Good Fair	A lively and dynamic performer, offering a credible if bright sound at a competitive price	30W hdph tone controls (MM)		50
YBA Model 3 Pre/Power £995/£995	Good Good	Suited to highish sens. loudspeakers this duo produced see-through, ethereal stereo images that were more convincing towards the centre of the soundstage than at the edges	56W stereo amp MM only with 3 line i/p's. Separate L/R volume controls		72
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

* rating refers to original, tested model

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 £696	Good Very Good	To the author's knowledge, the most awesomely dynamic and articulate miniature ever made	29.5 x 18 x 25cm semi-open space	88dB/W 60Hz	R	59
Acoustic Energy AE2 £1138	Good Very Good	Dynamic, solid and lively, a great allrounder if a bit small considering the price. AE proves that metal cone/dome drivers really work.	39 x 23.5 x 29.5cm heavy stands in free space	88.5dB/W 45Hz	R	66
Acoustic Energy AE4 £1880 (stands £550)	Good Good	Magnificent but also seriously flawed, the AE4 possesses tremendous dynamic realism but a very mid-dominant balance. Large rooms and wallets only need apply.	54 x 32.5 x 44cm own stands in free space	90dB/W 40Hz		71
Acoustic Research Red Box £99	Average Average	Lively and balanced if a bit crude and uneven, this under-£100 econobox succeeds partly because of its simplicity, and works well with some rear wall assistance.	32 x 19.5 x 17cm close to rear wall	87dB/W 85Hz	R	74
Acoustic Research AR112 £125	Average Average -	Nicely presented and engineered, but sounds a bit small and boxy without true coherence.	36 x 19 x 18.5cm stands near rear wall	87dB/W 75Hz		66
Acoustic Research AR122 £150	Average Average	Despite a promising enough list of ingredients, the 122 failed to excite real enthusiasm amongst the listening panel!	38.5 x 19 x 22cm stands near rear wall	87dB/W 68Hz		68
Acoustic Research AR132 £200	Average + Average -	Good presentation and detail engineering was not sufficient to counter bass heavy balance problems on auditioning	44.5 x 23 x 25.5cm stands 1ft from rear wall	87dB/W 50Hz		66
Alexander 514 £139	Average - Average -	If you must settle for overgrown headphones, these may be your best bet, but don't expect miracles from this too tiny box.	22 x 11 x 9.5cm close to rear wall	82dB/W 90Hz	R	74

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Alexander 566 £159	Good— Average—	Unusual shape, metal-jacket miniature that works well within limited dynamic range capability; needs free space siting.	40.5 x 11 x 16 narrow stands in free space	83dB/W 70Hz		71
Alexander Aurora £379	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
Allison C06 £290	Average Good—	An unusual cube-shaped model designed for wall mounting gives exceptional bass extension from a small box, though it's also a bit heavy, coloured and slow	28.5 x 28.5 x 28.5cm stands against rear wall	88dB/W 45Hz	R	71
Alphason Orpheus £800	Good Good+	Large hi-tech two-way features unusual, sweet-sounding isodynamic tweeter; well engineered and balanced if a shade odd in appearance	65.5 x 28 x 34cm stands near rear wall	87dB/W 43Hz	R	71
Apogee 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
A&R Arcam Three £149	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 £270	Good Average	Most things to most men this compact is unlikely to disappoint with its lively "bally" character though lacking weight... a bit	38 x 23 x 28cm near wall shelf or 40cm stands	88dB/W 55Hz		59
A&R Arcam One Plus £359	Good Average	Provides a solid, weighty and rich sound, but is a little raw in the treble and indefinite in the midband	22.3 x 28.1 x 37.8cm open space, on stands	88.5dB/W 60Hz		59
Ariston Image £159	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
Audio Electronics TC10 II £599	Good— Good+	Oddball appearance is rescued by a respectable technical performance, interesting and impressive engineering and fine sound quality at a realistic price.	70 x 33.5 x 33.5cm low stands in free space	87.5dB/W 40Hz	R	68
Avance 120 £279	Average+ Average+	This unusual "after eighties" looking speaker has the recipe for success, but not quite the right seasoning yet	42 x 30 x 30cm 30cm from wall on 40cm stands	86.5dB/W 60Hz		53
B&W DM550 £149	Good+ Average—	Beautifully presented, well engineered near-miniature with precise sound but a distinct lack of 'wellig'. Ideal for considerate flat dwellers	35 x 20.5 x 22.5cm stands in free space	86dB/W 70Hz		71
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 CM1 £345	Good Average	Cleverly thought out luxury design package is also fundamentally well engineered, if a shade pricey on 'sound for pound' basis	24.5 x 16 x 22cm close to rear wall	84dB/W 90Hz		74
B&W DM1600 £369	Good Good	Crisp, dynamic loudspeaker with tight but not especially deep bass and a tweeter that sometimes sounds overcooked	49 x 23.6 x 30cm free space, open stands	87.5dB/W 60Hz	R	59
BLQ Q2 £275	Average— Average	Nearly a good loudspeaker, the basic balance is good, but the midband is very uneven and there are severe losses of resolution, 'space' and dynamics	43 x 25.1 x 24.5 semi open on stands	87.5dB/W 70Hz		59
Bose Interaudio 3000XL £140	Average Average—	Lots of perceived value and well enough balanced, but low cost cabinet and driver engineering results in a crude and unsuitable sound	46.5 x 29 x 23cm stands in free space	89dB/W 45Hz		71
Boston A4011 £120	Average Average—	Competent performance for size and price but below average relative to the UK competition	34 x 21 x 20cm on stands near wall	88.5dB/W 63Hz		41
Canton Plus S £140	Average Poor	Bright treble and virtual absence of any bass at all is too high a price to pay for an almost invisible loudspeaker	20 x 12 x 12cm against rear wall	87dB/W 130Hz		74
Canton Karat 20 £300	Good+ Average+	Very prettily finished and accomplished near-miniature, the bright-sounding '20's only difficulty lies in justifying its high price	34 x 22 x 20cm stands in free space	87dB/W 55Hz	R	71
Canton Karat 40 £550	Average Average	Pretty and compact three-way for those who mourn the passing of the loudness control — definitely errs on the boom'n'tizz side	50 x 27 x 27cm stands in free space	88dB/W 50Hz		71
Canton 60 Karat £630	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
Celef CF2 Nimbus £230	Good— Good—	Nicely balanced overall but a little uneven with it, this lively and dynamic large bookshelf model came close to Recommendation	46 x 25.2 x 24cm stands in free space	88dB/W 55Hz		71

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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 £799	Good+ Good	This Aerolam high tech miniature has certain remarkable qualities that some will find irresistible, and which go a long way towards justifying the highish price. Needs careful system and room matching	27 x 20 x 23cm matching stands in free space	82dB/W 52Hz		68
Celestion SL700 £1349 inc stands	Good Good	Very sophisticated, mostly smooth and accurate transducer, with fast but not very deep bass and a rather bright treble	37.5 x 20 x 23.5cm free air on tall stands	83dB/W 45Hz		60
Celestion 6000 £1470	Very Good Very Good	A genuine fullrange audiophile quality speaker system – with Star Wars styling to suit a high tech environment	Complex, on floor in free space	82.5dB/W	R	60
Chameleon 500 £349	Average— Average—	Sounding badly coloured, dull and compressed, it is also amateurishly constructed, despite using good quality materials	38 x 25.3 x 31.3cm free, stands	89.5dB/W 75Hz		59
Duntech PCL500 Marquis £3500	n/a Very Good	Better value for money than the Crown Prince – and arguably more dynamic, with real bass 'slam' – but a little less refined in the higher registers	147.5 x 27 x 40 free standing away from walls	92dB/W 48Hz	R	65
Duntech PCL1000 Crown Prince £6120	n/a Very Good+	Immensely 'listenable', refined sounding speaker capable of creating lifelike musical images. Not overly transparent to source, but very civilised nonetheless	180 x 30.5 x 43.5 free standing away from walls	90dB/W 42Hz	R	72
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 £300	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 £90	Average+ Average	More wham-bam-thankyou-mam sound that imitates much bigger speakers when you let these babies yell. (A well-controlled yell!)	26 x 17 x 19cm near wall on shelf or stand	86dB/W 85Hz	BB	59
Goodmans Point 3 £100	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 Sterling Point 5s £139	Good— Average—	Looks a remarkably good deal with apparently good engineering, but the room drive is mid-dominant and the sound is loud but not that likeable.	56 x 29 x 26cm stands in free space	89dB/W 60Hz		71
Goodmans Point 7 £180	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 £330	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 £499	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
Heco Interior 90S £129	Good Average—	Neatly finished and engineered miniature, but the disappointingly 'lifeless' sound left the listening panel decidedly overwhelmed	27 x 18 x 16cm on high stands	87.5dB/W 90Hz		74
Heco Interior 430s £399	Good Good—	This tall floorstanding enclosure delivers an impressively even sound balance with good bass extension, if not the lively dynamics to satisfy enthusiasts	85 x 24 x 27.5cm free space	88dB/W 43Hz	R	71
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 £169	Average Average	Physically an attractive package, but not entirely convincing in lab or listening panel test; interesting for all that	40.5 x 23 x 23cm stands against rear wall	85dB/W 60Hz		68
Heybrook HB1 £189	Good Average+	No longer an over-bright character, a strikingly clear sound and fine transient performance now merits recommendation	47 x 29 x 23cm on stands near wall	88dB/W 61Hz	R	46
Heybrook HB100 £249	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 £130	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 Kappa 6 £725	Good Good	Interestingly styled US loudspeaker has unusual high tech drivers and good neutrality, but the sound seriously lacks excitement	63 x 38 x 24cm stands, free space	85dB/W 35Hz		66
Infinity Kappa 8 £1650	n/a Good++	Very nicely made and unobtrusive but large four-way speakers which have a tendency to sound bass heavy unless used with solid core cables	118 x 51.5 x 17.5cm floor standing, open space	89dB/W 33Hz		72
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 TLX12 £149	Good— Average	This smart near-miniature has a 'boppy', lively bottom end, but beware of the fizz in its top	37 x 23 x 23cm stands 0.5m from rear wall	87dB/W 55Hz	R	71
JBL LX44 £340	Good— Average	This generously built model offers good power handling, bass extension and dynamic range, but suffers from the 'three-way syndrome', with middle middle	58.5 x 30 x 29cm stands in free space	89dB/W 40Hz		71
JBL L 60T £449	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
JPW Sonata £99	Good Average+	Well balanced and integrated, this near-miniature offers fine sound if limited bass and dynamic range, plus real tree wood at a nearly silly price	32 x 23 x 20cm stands near rear wall	86dB/W 55Hz	BB	71
JPW 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 Good	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvils	46 x 26 x 25cm 40cm from wall on 45cm 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 C15 £99	Good Average	One of the tiniest around delivers a surprisingly 'big' and well balanced sound, with excellent stereo from free space siting	26.5 x 18 x 14cm stands in free space	85dB/W 60Hz	R	71
KEF C75 £349	Good Good	Compact floorstanding model's Uni-Q driver provides fine crossover integration, giving stable stereo and fine dynamic range within a slightly 'rich' balance	72 x 24.5 x 25.5cm floor in free space	90dB/W 45Hz	R	71
KEF R102 £365	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

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THE DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
KEF 103/3 £680	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) £895 (£994)	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 £2025	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 4.5cm on floor in free space	87.5dB/W 20Hz	R	60
Linn Helix £279	Average+ Good	Attractive presentation is coupled with an attractively lively sound which is more neutral if less committed than earlier Linn loudspeakers	51 x 25.5 x 28cm stands 1ft from rear wall	88dB/W 53Hz	R	66
Linn Nexus £379	Good Average	Good features include a solid, meaty bass plus good imagery and tonal balance. The catch is that Nexus lacks resolution and timing	49 x 23.5 x 30.4cm near rear wall supplied stands	89dB/W 60Hz		59
Linn Sara £795	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 MG1.4 £1098	Good+ Good+	Replaces the stalwart MG1c with a revised panel layout. Offers a very crisp and articulate sound, particularly revealing of upper mid vocal details	155 x 8 x 57cm open space	88dB 40Hz	R	72
Magneplanar MG2.5R £1897	Good Good	Offers the low coloration and profound musical insight of better electrostatic loudspeakers but without loss of low frequency extension	183 x 56 x 4.5cm Open space	83-85dB/W 35Hz	R	60
Magneplanar 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 OMS £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
Marantz LD50DMS £200	Very Good Good—	Well behaved larger two-way has fine balance, stereo and integration with good bass extension, albeit with mild 'boxy', 'chesty' and 'fizzy' effects	42.5 x 27 x 28cm stands in free space	87dB/W 50Hz	BB	71
Martin Logan CLS II £3750	n/a Very Good	Much improved high resolution design, fussy about system set-up and demanding of ancillaries and software alike. It rewards the efforts though	60 x 28 x 7.5cm open space	86dB/W 45Hz	R	72
MB Quart 220 £270	Average— Average	The elaborate and pretty enclosure in a wide range of finishes works better than the drivers and crossover, which impose a lumpy balance	30 x 22.5 x 21cm stands in free space	87.5dB/W 80Hz		74
MB Quart 390 £469	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 £775	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 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 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 763 £280	Average+ Average+	A very artful combination of generous volume and good bass extension at a modest price. Works well in the listening room despite a few rough edges	77 x 25 x 32cm near rear wall	86dB 40Hz	BB	68
Mission Cyrus 782 £340 (stands £80)	Good— Good—	Lively, articulate and beautifully finished, this compact wall-mount model with twin main drivers has good integration but a rather rich, 'loudness' balance	50 x 25 x 32.5cm Cyrus stands near wall	90dB/W 50Hz		71
Mission 764 £400	Good Good—	Large floorstander has fine bass extension but limited dynamic range, and sounds 'lazier' than Best Buy 763	86 x 25 x 32cm 0.5+m from rear wall	86dB/W 43Hz		71
Monitor Audio Monitor 7 £150	Average— Average	This lively and punchy near-miniature looks pretty enough and is good value but is let down by an unruly and indifferently integrated tweeter	34 x 16.5 x 17cm stands 1ft from wall	84dB/W 70Hz		74
Monitor Audio RT00 £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 R300/MD £250	Average Average—	An attractive 'large bookshelf' model that's handicapped by poor crossover and integration between paper cone bass and metal dome tweeter	47.5 x 25 x 30.5cm stands in free space	88dB/W 50Hz		71
Monitor Audio R352/MD £299	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/Gold MD £449	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 £799	Average Average+	This smooth and civilised slimline floorstanding loudspeaker is well built and nicely presented. But it is also expensive	94 x 20 x 26cm in free space	85dB/W 48Hz		68
Mordaunt Short MST0 II £90	Average Average—	One of the best miniatures around. A borderline Best Buy because of the bass limitations, which may depend on your taste	29 x 20 x 17cm wall bracket	86dB/W 75Hz	R	53
Mordaunt Short MS100 £189	Average+ Average+	A 'mid forward' tonal balance is its main drawback but other aspects such as ambience, transparency and stereo depth compensate	32.5 x 22.5 x 21.5cm stands near wall	85dB/W 80Hz	R	46
Mordaunt Short 45Ti £230	Good Average	A sensitive tandem-bass number that can be driven loud but loses its balance a bit and can be unsubtle	63 x 26 x 30cm low (20cm) stand near wall	90.5dB/W 52Hz		53
Mordaunt Short MS300 £319	Average+ Average+	Not considered particularly competitive in its class, though it has good power handling and stereo focus	54 x 22.5 x 25cm on stands near wall	89dB/W 65Hz		46
Mordaunt Short 442 £1150	Good+ Good++	A resounding success with the listening panels. Make sure your room can accommodate the bass	95 x 26 x 38cm floor standing in free space	87.5dB/W 40Hz	R	60
Musical Fidelity Reference 2 £199	Good— Good—	This compact wall-mount design with advanced drivers has good dynamics, balance and stereo, plus flashy styling and some midband 'boxy' coloration	38 x 25 x 20cm stands near rear wall	88dB/W 50Hz		71
Musical Fidelity MC-2* £299	Very Good 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+ 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
NVA Cube 1 £600 (stands £200)	Good— Good+	Attractive, cube-shaped semi-omni is very sturdily built, and gives an idiosyncratic but unusually open, spacious and informative sound	33 x 32 x 32cm own stands c0.5m from wall	85dB/W 52Hz	R	71
Opus 3 Credo £399	Average Average	Credo's odd-shaped silicone-based cabinet confers good box and bass performance, but the sound could be more neutral for the price	32 x 28 x 32cm stands in free space	88dB/W 65Hz		74
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

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

THE DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Quad ESL-63 £1538	Good+ Good++	With its unusual but subtle characteristics this classic electrostatic may not be punchy in the bass, but has strengths that some cannot live without	92 x 66 x 27cm open stand well clear of wall	84dB/W 34Hz	R	60
Richard Allan CD5 £242	Average— Average—	This neatly presented small reflex design can sound engagingly communicative, but is flawed sonically and technically and quite expensive too	38 x 19 x 23cm on rigid stands	88dB/W 80Hz		68
Rogers 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
Rotel RL850 II £130	Average+ Average+	Strongly recommended. Well-balanced, clear, with decent focus and fine stereo, but tendency to 'heaviness' needs decent stands and space	44 x 25 x 24cm free space on 40cm stands	86.5dB/W 50Hz	BB	59
Royd A7 Series 11 £99	Average+ Average	Lively clear sound; good upper bass and dynamics, but treble "ramp" made vocals sound shut in. Try before you buy	31 x 20 x 17cm shelf or 50cm stands near wall	86dB/W 75Hz	R	53
Royd 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
Ruark Swordsman £200	Good Average	Very attractively styled and finished, the Swordsman is a well built 'small bookshelf' model that delivered better test than listening results	38.5 x 20 x 27.5cm stands 0.5m from wall	84dB/W 50Hz		71
SD Acoustics DBS £695	Average Good+	Large but unusually pretty, needs a big(ish) room and has a sting at the top, but the transparent dipole midband provides an unusually open and dynamic sound	102 x 35 x 25cm spiked, in free space	86dB/W 45Hz	R	71
SD Acoustics SD1 £1150	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
Shan Shimna £280 (stands £75)	Average+ Good—	Pretty little miniature in cast mineral/plastics has limited dynamic range and could sound smoother, but integration is good and box effects slight	31 x 16 x 17cm stands near rear wall	84dB/W 65Hz	R	71
Snell Type C £2350	n/a Very Good	Pricey, yes, but an extremely capable loudspeaker. Musical and transparent; excellent bass extension	112 x 38 x 33 free standing away from walls	90dB 35Hz	R	65
Sony APM-101ES £99	Good Average	Big hearted sound from small bookshelf successor to BB '10ES, sounds a little untidy at frequency extremes, so suits CD better than vinyl	39.5 x 22.5 x 23.5cm stands in open space	86dB/W 52Hz	R	71
Sony APM-181ES £300	Very Good Average	Big and beefy but also somewhat fat and bass heavy, this well engineered three-way has notable strengths but lacks transparency and sounds better at lower levels	57.5 x 29 x 36cm stands in open space	87dB/W 40Hz		71
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 SP2 £470	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 £710	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 £1500	— Good+	Same as Spendor SA3 active	85 x 38 x 46cm low	89dB/W 32Hz	R	46
Spendor SA3 Active £2900	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 TC50 £595	Good— Good	This triangular-profile 'grown up' miniature is a shade boxy and laid back but has good rhythmic and musical integrity	40.5 x 33 x 29cm stands in open space	88dB/W 55Hz		71
Spica TC50SE £795	Good— Good	A heavily UK-modified TC50, the SE sounds less boxy and more spacious, but lacks some of the urgency of the standard model	40.5 x 33 x 29cm stands in open space	88dB/W 55Hz		71
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 DC1000 £199	Average Average—	The smaller of two DC models with dual concentric drivers, the '1000 is much less well balanced than the larger, floorstanding '2000	50 x 24 x 25cm	91dB/W 53Hz		71
Tannoy M20 Gold £200	Good Average+	Luxury version of Mercury S with real wood and bi-wire frills doesn't necessarily sound any better overall, but still fine value	49.5 x 25 x 21.5cm stands in free space	87dB/W 50Hz	R	68
Tannoy DC2000 £300	Good Good	Remarkably high sensitivity from unique dual concentric driver that has an involving but characteristic sound. Bass could be better	68.5 x 26 x 27cm floor in free space	93dB/W 55Hz	R	66

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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 SS33-M £90	Average Average	Providing a benchmark for budget loudspeakers, this Toshiba-inspired but UK designed and manufactured model is a lot of loudspeaker for the money, if a shade on the cheap	40 x 26 x 21.5cm stands in free space	86dB/W 55Hz	BB	68
Townshend Glastonbury II £1700	n/a Very Good	What? No bass? Actually, like the KEF 107, Glastonbury II goes down so low you might not notice how good it is. A truly remarkable performer. Superb soundstaging too	91.5 x 28 x 46 free standing in room corners	88dB 27Hz	R	65
Videotone Minimax 2 £80	Poor Average-	Cheap in build and QC as well as price, but cheerful (if coarse) with it - if a little too cheerful after extended listening...	27.5 x 17 x 20cm near rear wall	84dB/W 90Hz	R	74
Visonik David 6000i £160	Average- Poor	Sharp styling a classy looking miniature makes, but the complex grillework worsens a sound which starts off with too much top and not enough bottom	20 x 12 x 13cm against rear wall	87dB/W 130Hz		74
Wharfedale 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 £139	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 80Hz	R	68
Wharfedale 505/2 £169	Average Good	This lively Wharfedale provides plenty of speaker with unusual refinement for the money, and should be fairly tolerant of room siting	44 x 25.5 x 24cm stands 1ft from wall	86dB/W 55Hz	BB	66
Wharfedale 510/2 £299	Average Average-	Even in it's latest guise, this loudspeaker still sounds hard, cluttered and lacking innate clarity. The bass is uneven and midband coloured	61.5 x 28 x 29.6cm near wall, high stands	89dB/W 50Hz		59
Yamaha NS 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 one effective technique, but many decks have manual bias adjustment and some match up to the tape automatically.) Lab performance and sound quality often go hand in hand, and are frequently somewhat dependent upon factory alignment. The mechanical integrity of the mechanism itself is another crucial factor, that is often reflected in the asking price.

All modern hi-fi decks have Dolby B and the majority have Dolby C besides; the very worthwhile

HX Pro system is becoming steadily more widespread. Remote control remains rare, though sometimes it is available as a system option. Three-head recorders allow simultaneous checking of the recording being made. Auto-reverse is a useful convenience feature, but usually with some mechanical compromise, while double-mechanism 'dubbing' decks of dubious quality are fashionable at the bottom end of the market. The welter of different 'music search' systems available is some indication of their frequent ineffectiveness.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research RD-06 £280	Average Average+	Acceptable middle market player with very simple facilities and cramped control section, but unusually good looks	Dolby B/C HX Pro, fine bias, counter memory, repeat		69
Aiwa AD-F270 £90	Average Average+	An excellent budget machine, adequately equipped and satisfactorily built. Sound quality is in severe danger of transcending the price category	Dolby B/C, fine bias adjust	BB	75
Aiwa AD-F370 £130	Average Average	Adequate but uninspiring recorder with detail shortcomings but good control layout and successful sounding with recorded musicassettes	Dolby B, C, HX Pro, bias adjust		63
Aiwa AD-R470 £150	Average Good	For once, an auto-reverse deck with the performance of a decent unidirectional one at a similar price. The Aiwa is modern in concept and execution, and has good, transparent electronics	Dolby B/C/HX Pro, auto reverse, cue & review, bias adjust	BB	69
Aiwa AD-WX777 £179	Very Good Very Good	Excellent, middle price dual deck with quick side change and a living, breathing sound - though prerecorded tapes sound bright	Twin auto-reverse, one records. Dolby B/C, fine bias	BB	75
Aiwa AD-F700 £199	Good Average-	Somewhat less than the sum of the (most fine) individual parts, this deck has an artificial quality which spoiled the efforts of a fine transport	Dolby B/C/HX Pro, fine bias, CD Direct input		75
Aiwa AD-F800 £249	Good Very Good	Close to first class performance - and superb value. The Aiwa is purposeful and finely engineered. It provides a near irresistible blend of good mechanics and electronics	3 head, dual capstan, Dolby B/C/HX Pro, tape calibration	BB	75
Aiwa AD-WX888 £249	Good Good	Inaccurate set-up spoils metal tape operation, but with other tapes the deck works well. This deck offers fine engineering, facilities and sound	Dual auto-reverse twin deck, Dolby B, C and HX Pro	R	75
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 yanks	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment, CD direct	R	63
Akai GX-32 £200	Average Poor	Constrained and smeared sum this deck well. It has poor bass and treble definition alike, though it proved well aligned for prerecorded cassettes	Dolby B/C, variable bias, headphone out, track search		69
Akai GX-52 £249	Very Good Very Good	Well finished and a pleasure to use this well specified deck sounds clean and defined with all tape groups, with or without Dolby	Dolby B, C, HX Pro, track locate features	BB	57
Akai GX-6 £350	Good Good	There is a strong sense that someone has really thought this one through; it has an indefinable 'specialness'	Real-time counter, track search, Dolby B, C, bias adjust	R	52

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai GX-95 £400	Good Very Good	Well designed and finished cassette deck with features well judged to please the audiophile – especially switchable Dolby HX Pro and switchable panel display. The calibration system is simple and effective, and the deck sounds great	Dolby B/C/HX Pro, 3 head, manual tape set-up	R	69
Denon DR-M07 £125	Poor + Average	There were several problems with the test player that render it an unsafe purchase. This is a pity since despite the antiquated control system, the deck is capable of refined sound quality	Dolby B/C, fine bias adjust		69
Denon DRM-500 £170	Good Very Good	Powerful, refined and detailed sound, and an excellent transport are keys to the success of this cleanly styled addition to the range – but why no timer standby?	Dolby B/C/HX Pro, variable bias	BB	75
Denon DR-M12HX £220	Good Good +	Well constructed and pleasant to use, a lack of true pitch constancy kept it from sounding superb	Track search, Dolby B, C, HX Pro, bias adjust	R	57
Denon DRW-750 £229	Good Good	Polished and articulate, the only significant shortcoming is poor performance with prerecorded material	Dolby B/C/HX Pro, twin unidirectional, one records	R	69
Denon DR-M24HX £290	Good Good +	This deck will slot into many high grade systems without disgracing itself – or the cassette medium. Very presentable high resolution sound with good stereo with or without Dolby	Dolby B, C, HX Pro, bias adjust, 3 Head	R	60
Denon DRM-800 £299	Good Very Good	There are some niggling faults and limitations (no timer standby is particularly annoying), but as a means of recording music it sets a very high standard	Dolby B/C/HX Pro, off tape monitoring, dual capstan	R	75
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
Dual CC8010 £110	Average Average +	The only limitation worth noting is a slight opaqueness; the Dual otherwise sounds stable and effective. An excellent low-cost design	Dolby B & C, microphone input	BB	63
Goodmans GSW-5200 £90	Poor Poor	Musically unimpressive but at least it's cheap!	Dolby B, twin, one records		69
Grundig Fine Arts CCT-903 n/a (system component)	Good Good –	(Competent part of complete Grundig system). Solid and well engineered deck with small but significant problems preventing it scoring highly. Basic design generally – and transport specifically – are excellent	Dolby B/C, twin auto reverse, one records		69
Harman Kardon CD491 £695	Good Good +	Excellent audio engineering and tremendous flexibility make this an audiophile cassette deck 'par excellence'	Real-time counter, auto reverse, track search, Dolby B, C, HX Pro, bias adjust	R	52
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-3010 £170	Average + Average	Minor ergonomic shortcomings notwithstanding, this is a workmanlike deck that only misses recommendation due to an azimuth problem leading to very dull sound with prerecorded tapes.	Dolby B, C, HX Pro, auto bias		75
Kenwood KX-5010 £269	Very Good Excellent	This important new middle price deck is a well thought through and thoroughly developed design which eschews gimmicks for the sake of musical excellence	Dolby B/C/HX Pro, auto tape calibration, track/intro search	BB	69
Kenwood KX-9010 £400	Very Good Average +	Clean, detailed but flat and overtly hi-fi-ish sound quality makes the 9010 a little less than the sum of its parts.	3-head, auto tape calibration, Dolby B/C/HX Pro, remote control		75
Marantz SD-35 £150	Good Good +	Rock steady tape transport gives very competitive sound quality for the price, but the slightly bright replay may not appeal to some	Dolby B & C, bias adjust	R	52
Marantz SD-45II £200	Good + Good +	Well built and dynamic sounding player, working better as a recorder than with musicassettes	Dolby B & C, bias adjust Auto selection	R	52
Marantz CP230 £300	Average Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, bias adjust	R	52
Marantz SD-55 £349	Good Very Good	Slightly tacky feel and restricted signal/noise performance are the main shortcomings of an excellent sounding piece of kit	Real-time counter, track search, Dolby B/C/HX Pro, bias adjust, 3 Head	R	57
Marantz SD585 £300	Average Average –	Sound quality is a little sat upon, and control ergonomics are somewhat opaque, though the twin auto-reverse/recording capability makes this a powerful machine	Dolby B/C, twin auto-reverse & record, parallel recording etc		69
Memorex SCT-84 £200	Average + Average +	The playback only transport is a little disappointing, but the record one is a quality item and the deck works well. Ergonomics are good, but styling and control feel are decidedly tacky	Dolby B/C, fine bias, twin with auto-reverse record, unidirectional play	R	69
NAD 6300 £550	Very Good Very Good	Solid and homogeneous sound quality and very good replay compatibility thanks to 'play trim'. Distinctive, musical – and costly	Dolby B, C, HX Pro, 3 Head, bias adjust	R	63
Nakamichi CR-1E £345	Very Good Good	Modestly equipped by any standards, the CR-1E stands or falls by its build quality, which is high, and sound which is highly competent	Dolby B & C		57
Nakamichi CR-2E £395	Very Good Good +	Ordinary to look at, in some respects rather awkward to use (tape switching especially), the CR-2E sounds very slightly better than the CR-1E, and therefore ranks well. But it doesn't come cheap	Dolby B & C, bias adjust, remote control	R	57
Nakamichi RX-202E £545	Good Very Good +	Fine, clear and articulate sounding player. Excellent with prerecorded material, but idiosyncratic and sometimes obstructive control system	Auto reverse, Dolby B, C, 2 Head	R	63
Nakamichi CR-3E £595	Very Good Very Good	The user interface is a little clumsy, though conceptually straightforward. Sound quality approaches the CR-4E, and is amongst the best at the price.	Dolby B & C, bias adjust, remote control	R	57
Nakamichi CR-4E £745	Very Good + Very Good +	High class deck with a reasonably full range of features and superb sound at a slightly unlikely price	Dolby B & C, bias adjust, remote control, 3 Head	R	57
Nakamichi CR-5E £995	Excellent Excellent	A slightly simplified version of the all-conquering CR-7, the CR-5 has a very similar standard of audio performance – the best	Dolby B/C, fine bias, 3-head	R	69
Nakamichi CR-7E £1500	Excellent Excellent	Remarkably this deck is not only ergonomically but also sonically superior to the Dragon, particularly on record/replay	Real-time counter, track search, Dolby B & C, tape alignment adjust, bias adjust, remote control, 3 Head	R	60
Nakamichi Dragon £1750	Excellent Excellent	Previous to the birth of the CR-7E, this machine stood head and shoulders above the rest. It is still the ultimate for musicassette replay	Auto reverse, Dolby B & C, tape alignment adjust, bias adjust, remote		60
Onkyo TA-2120 £130	Average + Good	Clear, vivid sound with good timing and resolution when using Type II tapes without Dolby. The controls are less inspiring – the meters in particular are plainly inadequate	Dolby B/C, auto tape sensing, block/side repeat	R	63
Onkyo TA 2130 £160	Average + Average +	Rating fairly well on both pre-recorded and record/playback, ergonomics were a little poor but overall performance was generally consistent	Track search, Dolby B & C, bias adjust		52
Philips FC566 £179	Average + Average +	Mostly well equipped, though some tape search facilities fail to exploit the auto-reverse capability. Sounds clean and stable – with prerecorded tapes too	Auto reverse, track search, Dolby B & C		57
Philips FC567 £279	Average Poor	Well equipped but ergonomically substandard; sound quality is messy and lacking in clarity and dynamics	Dual deck, auto reverse, track search, Dolby B & C		57
Pioneer CT-656 £250	Good Good	Well conceived and executed low cost 3-head recorder. It benefits from and makes good use of metal tapes, but is never less than couth and stable sounding – even with ferric tapes	3 heads, off tape monitoring, fine bias, Dolby B/C/HX Pro	R	75
Pioneer CT-737 Mk II £350	Good Average +	Easy to use and sensibly equipped, the CT-737 is much improved, but sound quality is still a tad lacklustre	3-head, Dolby B/C/HX Pro, manual record bias/sensitivity		75
Pioneer CT-91a £500	Very Good + Very Good +	Superb, near state of the art recorder with an excellent dual capstan transport and very capable electronics. At the price, this one is a mould breaker	3-head, tape calibration, Dolby B/C/HX Pro	R	75

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THE DIRECTORY

CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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 unremitting 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-S £1481	Very Good Very Good+	This is a superbly engineered deck with a classically fine performance that almost transcends the stereotypes. Ergonomics are flawed but the user interface is both powerful and flexible	3-head, dual capstan, Dolby B/C/HX Pro, auto calibration	R	75
Rotel RD-865 £200	Good Very Good	Fine, architecturally solid sound quality in a package with a low gimmick count and strong audiophile appeal	Dolby B/C/HX Pro, fine bias	BB	75
SAE C102 £549	Average+ Good	Looking most unlike a cassette deck designed in the States and proving competitive in its price group. Not sonically that outstanding, however	Real-time counter, track search, Dolby B & C		52
Sansui D-X301i £150	Average+ Good	Lively, informative and well equipped basic deck, if rather obscure operationally	Dolby B/C/HX Pro, variable bias, track search	R	69
Sony TC-FX110B £90	Poor+ Poor+	Woolly bass and scrappy treble combine to make a meal of many music types, despite accurate response shapes with most types of tape. Prerecorded material sounds dull	Dolby B/C		75
Sony TC-TX55 £150	Average Average+	The sound quality ranking is a good one for an auto reverse machine at this price level. Clean, sharp sound, only slightly let down in the deep bass	Auto reverse, Dolby B, C & HX Pro	R	75
Sony (WMD6C) ProWalkman £249	Good+ Very Good	"One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket"	Dolby B, & C	BB	60
Sony TC-RX60ES £250	Average Average	For once a stable sounding auto-reverse deck but sound quality is rather 'dirty' and compressed, especially with Dolby C	Auto-reverse, Dolby B/C/HX Pro, auto tape recognition		63
Sony TC-RX80ES £350	Average+ Good	Clean, powerful and detailed sound, especially without Dolby C. Stable pitch - but prerecorded cassettes sounded disappointing	Auto reverse, Dolby B/C/HX Pro, bias/level adjust	R	63
Teac V-250 £89	Average Average	Ultra-basic design which works quite well. Lack of pitch integrity is the main shortcoming, but it wasn't always noticeable	Dolby B	R	63
Teac V-270C £109	Average- Average-	Not quite cheap enough to compete solely on price, the V-270C is a rather messy and unstable sounding deck	Dolby B & C, bias adjust		63
Teac V-285CHX £115	Average- Poor	Poor, threadbare sound quality under most conditions of use. Cheap, but not a real bargain because it doesn't really work	Dolby B & C, fine bias adjust		75
Teac W-355 £119	Poor Average+	A better than expected performer. Often a little ragged, even unsteady, the design is nevertheless quite lively and engaging. A viable basic twin deck machine	One record, one play transport, Dolby B		75
Teac V-480 £129	Average Average+	A rather utilitarian model, the V-480 just makes it on to our recommended list by virtue of a clean, open sound that to an extent transcends the measurements	Dolby B/C/HX Pro, fine bias	R	75
Teac W-450R £159	Poor Average+	This model does a great deal for the money. It has severe measured shortcomings, but sound quality that is almost good enough. Interesting, but not quite obvious material for commendation	Twin auto-reverse, one records, Dolby B/C/HX Pro		75
Teac W-470 £179	Average- Average	A low grade transport is allied to respectable electronics to give sound quality ranging between acceptable and good. Prerecorded tapes sound bright	Twin deck, one records, Dolby B/C, intro-search		75
Teac V-870 £399	Good+ Good	Cut-down V-970X for the proletariat. Expensive and carefully engineered with mostly very good but slightly cold sound quality	Dolby B, C, HX Pro, 3 Head, manual tape calibration	R	63
Teac V-970X £499	Very Good Very Good	An excellent sounding deck with useful features (tape calibration etc) that fully justifies the price	Real-time counter, track search, Dolby B/C/dbx & Dolby HX Pro, bias adjust, remote control, 3 Head	R	57
Teac W-990RX £499	Good Good	A mess with dbx, but taut and articulate otherwise. The 990, though expensive, has a powerful range of features, making it one of the few really ambitious decks to successfully straddle both sets of requirements	Dolby B/C & dbx, dual auto-reverse/record, parallel & sequential recording, remote	R	69
Teac R-919X £599	Very Good Average	Superbly equipped, yet usable - and well built too. But sound quality is something of a disappointment at this price level, being appropriate for a model about half the price	3-head auto-reverse, tape calibration, Dolby B/C/HX Pro/dbx		75
Technics RS-B355 £140	Good Good	Good sound let down by inadequate meters and poor prerecorded replay only sound quality	Dolby B, C, microphone inputs, cue and review	R	63
Technics RS-B505 £160	Average+ Average+	Neatly made recorder with Dolby HX Pro that sounds precise and stable, though sometimes a little processed and grainy too	Track search, Dolby B/C/HX Pro		57
Technics RS-TR255 £160	Average Average	Neat, sensibly designed middle of the road dual transport recorder, suitable where the ability to dub tapes is a particular priority	Twin transports, one records and auto-reverse, Dolby B/C	R	75
Technics RS-B605 £180	Good Average+	Mixed but generally good sound. Weakest points are dbx and prerecorded sound, best are Type IV (metal) recordings which sound sharp and precise	Track search, Dolby B/C/HX Pro & dbx		57
Technics RS-TR355 £200	Average Average	Serviceable middle market dual deck without serious fault but with some annoying inadequacies, notably an inability to play side A and B and then stop	Twin auto-reverse, one records, Dolby B/C/HX Pro		75
Technics RS-B705 £250	Average Average-	3 heads for the price of two, but not the sound quality to go with them	Track search, Dolby B, C, HX Pro, bias adjust, 3 Head		52
Technics RS-B905 £350	Good Good	Good, well set up cassette deck with a clean, accurate sound but some compression. dbx circuit sounds poor	Dolby B, C, HX Pro, dbx, bias adjust, 3 Head		57
Technics RS-T80R £400	Poor Poor	Flexible and pleasant to use but poor transports led to poor sound on our latest sample	Dual deck, auto reverse, track search, Dolby B, C, dbx		52
Yamaha KX-230 £140	Average+ Average+	A strong near-budget performer, the strengths include good overall sound, excellent search aids. Weaknesses: ergonomics, soggy bass with prerecorded material	Dolby B/C/HX Pro, variable bias	R	75
Yamaha KX-300 £160	Average+ Average-	Uncommonly well equipped and adequately made and presented, this model turned out to be a disappointingly uncertain proposition on audition	Track search, Dolby B, C, HX Pro with 'play trim', bias adjust, remote control		57
Yamaha KX-400 £200	Good Good+	A highly commercial package with every widget under the sun. Happily it sounds good too.	Auto reverse, track search, Dolby B, C, HX Pro, remote control	R	52
Yamaha KX-500 £210	Very Good Very Good	An accomplished performer, strongest in the areas of pitch and spatial stability, but slightly rough around the edges	Real-time counter, track search, Dolby B/C/HX Pro with play trim, bias adjust, remote control	R	57
Yamaha KX-800 £330	Good Average	The present Yamaha range seems oddly inconsistent. This sophisticated model sounds fine (almost) but came a clear second best to the KX-500	Real-time counter, track search, Dolby B, C, HX Pro with play trim, bias adjust, 3 Head		57
Yamaha KX-1200 £500	Excellent Average+	A veritable rats' nest of buttons and dials, albeit well laid-out. This is nearly a great recorder, but lacks simplicity of sound	Real-time counter, track search, Dolby B, C, dbx, HX Pro, bias adjust, remote control		52

THE WORLD'S NO 1
GUIDE TO BUYING HI-FI

CASSETTE DECKS

HI-FI CHOICE

THE DIRECTORY

DAT RECORDERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa Excelia XD-001 £1300	Very Good Very Good	Clear and very listenable recorder roughly comparable to but slightly sweeter sounding than the Sony DCT-1000ES – but with an inferior front panel design	Track ID and search, remote	R	63
Grundig Fine Arts DAT-9000 n/a (system component)	Good Good	Conventional DAT recorder offering standard facilities. The deck is well made and equipped, and is engineered to a satisfactory quality standard. It performs to an acceptable standard, though it is not state of the art	2/4 hour recording, mic inputs, digital in/out		69
Luxman KD-117 £1499	Good Good	Slightly soggy, earth-bound sound quality, this model trails the other DAT decks tested so far	Two analogue inputs, remote twin address		63
Sony DTC-M100 £799	Very Good Very Good	Clean, clear sounding 2nd generation model with most of the features and sound of the DTC-1000ES	Midi-width, alpha-numeric display, remote, optical interfaces	R	63
Sony DTC-1000ES £1299	Very Good Very Good	Fine, consistent performer with accomplished tape handling and good build quality	Standard track ID and search, remote	R	63

CD PLAYERS

This all-digital music source is well established, despite still high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise with automatic and programmable play, plus track skip and fast music scan – frequently under full remote control. However, many vinyl enthusiasts find CDs sound less involving than

top quality vinyl replay. Introduced five years ago at around £500, CD players now average less than half that price, and for the main offer improved performance besides. Even cheaper players may have the latest decoding chips and the most useful play features; extra money can buy remote control, remote volume control, audio 'tweaks', plus improved build and component

quality control. Compared with many hi-fi components, CD players give impressive lab performance, though there are differences between players nonetheless. Sound quality variations are even more marked, particularly in a good quality system. As it behaves very like a preamp, there are no problems connecting a player to a normal amplifier.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
ADC CD 2000E £330	Good+ Fair+	One of the slimmest players in the business but nothing special inside. Nice ergonomics but overpriced	Remote, timeshared 16 bit		64
Aiwa DX-M45 £149	Fair Fair	Outdown Philips technology, but results are quite good for this British made machine	Manual	R	64
Aiwa CD-001 £300	Good Good	Pretty close to Recommendation, delivering a respectable sound quality and lab performance from an ergonomically attractive package, but ultimately failed to excel in any particular respect	Track entry/volume remote, direct recorder connection etc.		58
Aiwa XC-007 £499	Very Good Good	Creditable sound despite inverted output, high tech engineering with very good lab performance. A worthy contender but not cheap	Remote, keypad, timer, digital output, pseudo 20 bit, dual DAC		64
Akai CD-52 £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64
Akai CD-62 £330	Fair Very Good	Looks, build quality and the technical specification are right up to date. As it stands it sounds very good but if the indifferent lab performance could be improved, it would probably sound even better	Remote, programme, hdph, comprehensive display etc	BB	70
Akai CD-73 £450	Good Average	A little uneven musically, the Akai tends to smother fine detail, but has first class dynamics and stereo imagery. Worth auditioning	Track entry keypad remote, menu display (switchable)		62
Akai CD93 £700	Good Very Good	Undoubtedly a CD player of real class in build, presentation, lab performance and sound quality, but also a shade expensive for formal Recommendation – though that's not to dissuade lovers of black lacquer wood finish	Track entry remote, menu display etc.		58
Arcam Delta Black Box £250	n/a Very Good	This rich, powerful and articulate sounding DAC transforms the majority of medium price CD players. And apparently the Mk II version is even better	Needs D-out CD players	R	60
Cambridge Audio CD2 £650	Fair Very Good	The finest midrange in digital audio is sufficient grounds for Recommendation, though there remains a tinge of disappointment that the CD2 didn't get closer to big brother elsewhere, notably in the bass	16x oversampling, remote control	R	58
dbx DX5 £640	Good Poor	Sound quality proved a single disappointment, though it's refreshingly unique in providing semi-pro post-production facilities that some users will undoubtedly relish	Track entry/volume remote, compression, impact recovery, ambience etc.		58
Denon DCD 610 £200	Good+ Fair+	Lots of Denon player for the money, well equipped with good all round performance	Remote, versatile programming 2x 0/S	BB	64
Denon DCD 810 £250	Very Good Fair+	A good value allrounder bettered on sheet value by the 610 and 910; power volume could sound better	Remote, 4x oversampling, programming	R	64
Denon DCD 910 £300	Very Good Fair+	A well equipped deck of impressive appearance and solid sonic and lab performance	Remote volume, programming, 8x 0/S digital output	BB	64
Denon DCD-1500II £500	Very Good Very Good	The extra build quality over cheaper Denons is justified in terms of sound quality and lab performance, while the feature list is comprehensive and quite nicely presented	Track entry/volume remote, menu display etc.	R	60
Denon DCD-1520 £500	Very Good Very Good	High tech, high profile, high gadget content, good sounding player at an almost affordable price	Programme, hdph socket, remote, track entry, optical digital output	R	70
Denon DCD 1700 £650	Good+ Very Good	The overall sound was strong and coherent approaching reference standards. Fine build quality and facilities make this a firm contender	Remote, skip, scan, headphone socket, programmable	R	58

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Denon DCD 3520 £1000	Very Good Good+	Built like a battleship this new model takes its place at the top of the Denon range with a smooth and powerful sound, quite free of graininess	Composite 20-bit DACs, full programming features	R	72
Denon DCD-3300 £1200	Good+ + Very Good	Sounding tight and coherent though not significantly better than the cheaper 1700. Very well built and comprehensively equipped	Remote control, with volume, keypad programme, scan, search, headphone		51
Dual CD 1030 RC £170	Fair Fair	An up and down performance on test but it is hard to deny the overall value for a machine that includes remote control at this price	Remote, headphone socket, 2x 0/S, timeshared 16 bit	R	64
Ferguson CD007 £130	Good Fair	The cheapest recommendation in the test group; don't expect the earth but the value is good	Manual, digital output, headphone socket	R	64
Ferguson CD008 £150	Fair Fair	Not as strong as its relatives, sample fault perhaps? Though performance is fair enough overall	Remote, midi digital output, 2x 0/S, timeshare 16 bit		64
Goodmans GCD300 £129	Average Average	It may be adequately made, but with cheap good sounding players available this particular Goodmans isn't quite good enough	Programmable, skip, search, repeat		70
Goodmans GCD550 £199	Average+ Fair+	A slow autochanger with a weakish lab performance but the sound is fair enough, the features good and the price is low	Remote, 6 disc autochanger, 2x 0/S	BB	64
Grundig CD9000 £1000	Good Good	Aimed at a market which puts external styling above sound quality. Although this player is of slightly above average competence in most departments it is expensive	Remote, programme, hdph socket, calendar display etc		70
Kenwood DP-8010 £449	Good Fair	Top build quality and novel technological features seem to achieve little success here. While the technical performance is fine, the sound quality doesn't match its competitors	Track entry remote, memory display, sprung feet, optical digital output etc		70
Luxman D-90 £300	Fair Good	Despite technical ingredients that do not seem particularly inspiring, this is a nicely judged package that is ergonomically neater than most, with decent sound quality for the price and distinctive finish and presentation.	Track entry remote, programming etc.	R	58
Marantz CD583 £169	Very Good Good	Devoid of all but the CD essentials it makes up for in sound quality what it lacks elsewhere	Memory, track skip, search, etc	BB	70
Marantz CD85 £500	Very Good Very Good	This player may just miss a top sonic rating but it's well made and has plenty of features befitting a Marantz heavyweight	FTS, key pad remote, comprehensive display, programming, optical output etc	R	70
Marantz CD94/CD94 £1600	Very Good Very Good+	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
Marantz CD12LE £2500	Very Good Excellent	This top of the range two-box player may be very expensive but it is very well made. Technical performance is very good and the sound is the best from Marantz yet	Two box, digital processor, FTS, optical connection, hdph socket, comprehensive display, balanced output etc	R	70
Meridian CD207 £1050	Very Good Excellent	The 207 matures with age and in its present form it offers one of the best sounds around plus great packaging and versatility through its preamp options	On-board preamp, options, two box, coax digital output, remote	R	72
Micromega CDF1 Classic £1400	n/a Very Good	A very well made and stylish player from France, the CDF1 is a CD player for analogue lovers or as close as we've come across	Basic remote, digital output, suspended chassis	R	72
Micro Seiki CDM100 £3850	Very Good Good	One of the hernia inducing bricks of hi-fi, the Micro is extravagantly styled, finished and built. The good lab performance led to an 'only good' sonic display when the price demanded excellent	Balanced output, remote, display blanking		72
Mission PCM2 £500	Good+ Good	A matured design with good features it is the best sounding power volume player available, it even tests well. It accepts the £200 PSX power supply option	Remote volume, display and phase invert	R	64
NAD 5220 £230	Average- Poor	Conforms sonically to a stereotype of the medium that most players have grown out of. Hard, thin and raw sound with poor stereo and resolution.	Time/track display, memory		62
Nakamichi OMS-1E £395	Good Good	This neat enough player doesn't really follow the Nakamichi tradition of providing exceptional sound quality while at the same time perpetuates that of selling at an above average price	Simple remote etc.		58
Nakamichi CDP-2E £495	Very Good Good	It's ergonomically superior and has above average sound, but it isn't cheap. The standard of build quality and finish is first class which isn't quite matched by the sound quality	Programming, hdph, remote track entry, digital output		70
Nakamichi OMS-4E £1200	Very Good Very Good	Solidly controlled and comparatively simple this clearly represents one of the major benchmarks for CD sound quality, though the midrange sounded a touch thin	Skip and scan, headphone socket		51
Nakamichi OMS-5EII £1500	Good+ Very Good	"... delivers near state of the art performance and build quality in a deliberately starkly functional package, but at a very high price..."	Skip and scan, simple track programming, manual control		51
Nakamichi OMS-7EII £2000	Good+ Good	The only serious criticism here is of the price. And in our not always humble opinion you can get better sound quality for less elsewhere in Nakamichi's range	10 digit track entry keypad programming, headphones		51
Onkyo DX-1500 £170	Average Fair	Ruled out on the grounds of its poor DAC filter, but it's not so bad really given the price	Manual, 2x 0/S, timeshared 16 bit		64
Onkyo DX-3500 £250	Very Good Fair	It offers a lot of facilities and fine build quality for the money. Lab performance is very good but the sound quality doesn't inspire	Key pad remote, memory, hdph socket, comprehensive display etc		70
Onkyo DX-7500 £450	Good Very Good	This comes close to the state of the art performance in many areas. It has lots of facilities and is well made too.	Key pad remote, memory, hdph, very comprehensive display, optical digital output etc	R	70
Philips CD880 £500	Very Good Very Good	The '880 is an impressive blend of luxury build quality and features at a far from extravagant price, and also delivers the subjective goods	Volume remote, FTS, menu display etc.	R	60
Pioneer PD4100 £170	Fair Good	It's not perfect in the lab; the facilities are few, but the sound quality sets it apart	Programmable, skip, search, repeat	BB	70
Pioneer PD5100 £220	Fair Fair	It's well made and has good facilities. The lab performance is generally fine, but it's only average for sound quality	Remote, volume, programming, hdph socket, etc		70
Pioneer PD-5100 £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
Pioneer PD7100 £300	Good Good	External build quality is fine, the level of facilities are lavish, but the sound it produces only just takes it into the good category	Remote, volume headphone socket, versatile programming, faders etc		70
Pioneer PD-91 £800	Excellent Very Good+	Close to state of the art in nearly all areas - soundstaging, clarity and simple lack of artificiality. A well made and sophisticated player	Track entry remote, calendar display, index search, etc.	R	64
Revox B126 £649	Very Good Good	Made in Switzerland so the build quality and technical performance is high but then so is the price and the sound quality is only good	Programming, Revox remote system compatible		70
Rotel RCD820B £210	Good+ Fair+	A budget Philips based player of dependable sound quality and offering very good value. Build is a touch lightweight	Remote, basic facilities	BB	64
Rotel RCD820BX2 £250	Good Very Good	Start with a good base and then make it sound better, the '820BX2 CD player maintains the reputation established by its namesakes, and comfortably deserves Recommendation.	Direct track entry remote etc.	R	58
SAE D102 £700	Good Good	Considering the high price of this player, most of the innards seem fairly prosaic. Sound quality and lab performance are both respectable enough, but hardly justify the price premium involved, though styling is unusual.	Remote (inc volume), skip, scan etc.		58
Sharp DX150 £129	Fair Fair	This is a none oversampled player which is rather outclassed for technical and sonic merit by the vast majority of the competition. Pretty enough but would you want to put discs in it?	Programmable, skip, search, repeat		70
Sharp DX750 £179	Fair Fair	It has a remote control but it's too like the 150 which is rather outclassed for technical and sonic merit by the vast majority of the competition	Remote, programmable, skip, search, repeat		70

THE DIRECTORY

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Shure Ultra D6000 £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
Sonographe SD1 (by CJ) £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
Sony CDP-M55 £190	Fair Fair	£20 buys a remote control handset to operate your M35. Sony call it an M55 (see CDP-M35 review).	Simple remote, skip, scan, programming etc.	R	58
Sony CDP-M75 £230	Good Good	This midi version of the '750 saves £20 on the price (see CDP-750 review).	Track entry remote, menu display ect.	BB	58
Sony CDP-C5DM £250	Fair Fair	The Sony concept of an autochanger is interesting and executed with characteristic thoroughness. The lab and sound test results reveal it to be of only average quality	Carousel autochanger, remote, multi disc programming, variable hdph socket		70
Sony CDP-M95 £280	Very Good Fair+	Very well equipped mid sized player fine build and finish, incorporating Sony's custom file disc labelling	Remote, programmable, variable hdph output	R	64
Sony 557ESD £1000	Excellent Good+	Superbly built flagship model that produced excellent lab results and very good sound. Many luxury features though not that good value	Full remote, disc directory, digital output, power volume, 8x 0/S, 18 bit		64
Sony CDP-R1/OAS-R1 £5000	Very Good Excellent	Sony has aimed high with the R1 and in some ways has created the reference player. Build quality is amazing and it offers a high level of facilities. One or two faults were revealed in both the lab and the listening, but it's generally excellent	Two box, dual optical connection, digital processor, FTS, remote		72
Stax Quattro £2995	Very Good Very Good	Now in mkII guise this substantial player recreated exceptionally strong and convincing bass lines together with a beguilingly musical midband	18-bit DACs, 20-track memory, full IR remote, variable o/p	R	72
Teac ZD880 £450	Good Fair	Decent enough in most respects with a very good build and finish. Its sound isn't competitive enough to inspire any real enthusiasm	Remote, track key access, auto space, comprehensive display, hdph socket etc		70

CD MIDI SYSTEMS

So you want a hi-fi, but you don't want to make a fuss about it. A pre-packaged system with everything matching up and no aggravation may not rank with carefully chosen separates on sound quality, but there's no denying the attractiveness or popularity of this approach – the market for pre-packaged component hi-fi systems is at least as big as that for separate items, even ignoring the vast numbers of low-cost single unit stacker systems.

The arrival of compact disc led to a new fashion for shelf-standing compact systems, or 'midis' as

they are known in the trade, as a replacement for earlier floor-standing rack systems (themselves the upmarket development from music centres). Only some 330mm wide, midis can more or less match full-size (430mm) rack components for performance, and are certainly cheaper to make, ship, sell and buy.

Whereas specialist hi-fi is moving steadily towards ultra-simple 'no frills' components, midi systems tend to be sold on a feature count at a price point, usually with little opportunity for

demonstration and comparison. Our test programme includes extensive auditioning and lab testing, while making allowance for the different aspirations of designers and expectations of users. Key features valued highly by customers include system remote control, automatic switching, double 'dubbing' cassette decks, and elaborate equaliser tone controls. And the top end of the market is developing with surround sound audio/video-ready packages.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa X-55 £380	Average Average-	The turntable was slightly better than usual, the cassette deck highly limited, but the dreadful loudspeakers are the clincher	Combined cassette tuner-timer/amp, dedicated T/T speakers, & optional CD		65
Aiwa X-78 £550	Average+ Good	Good. The loudspeakers are disappointing and the turntable is excessively microphonic, but the rest of the system works well.	Auto reverse cassette/tuner/amp & timer, T/T and CD	R	65
Akai M.50CD £550	Poor Poor	Cassette lacks Type II compatibility, general sonics mediocre or less	Devolved from M.80 but simplified, part remote		65
Akai M.80CD £800	Good Good	Good all rounder with minor ergonomic shortcomings but generally practical layout	Separates based, twin auto-reverse cassette	R	65
Goodmans 5300CDM £400	Average- Average+	Crisply styled system with gutsy amplifier and sophisticated speakers. CD player works well, other sources are variously mediocre	Combined cassette/tuner/amp, plus T/T and CD with remote	R	65
Goodmans Maxim-Midi System £520	Average Average+	De-luxe version of 5200 system – very good value for money and readily upgradeable. Sonics rough but OK and speakers good; CD crude	All separates with twin cassette	R	54
JVC Midi-W900CD £1000	Good Good+	A competent allrounder, with important convenience related features, and powerful linked recording facilities. Less strident speakers would be appreciated	Separates system, equaliser, auto-reverse cassette	R	65
Marantz MX583 £750	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
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
Sharp SA-CD800H £700	Average Average-	A superficially high grade, high spec system, the SA-CD800H actually sounds clean but a little 'synthetic'	One-piece, 6-disc CD, no T/T		54
Sony Compact 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

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THE DIRECTORY

TUNERS

The radio medium operates at a much lower profile than TV, but in areas outside pop music the BBC service is the envy of the world. Live Prom concerts can rival all other sources from a hi-fi perspective. Only the FM (VHF) bands give stereo hi-fi sound, though AM (MW & LW) are useful for receiving certain transmissions in the UK.

Something of a hi-fi afterthought, tuners are often selected merely to match a chosen amplifier

cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is well spent.

Tuners come in two basic types. Analogue models tune gradually (and usually manually) across

the bands, and can have analogue or digital displays; they are often preferred for sound quality, and are certainly best for AM bands. Digital tuners offer convenient automatic tune facilities and hold many station positions in pre-set memories.

(The Lab and Sound results for models tested in issue No. 65 refer to FM only. For AM results see under Comments.)

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai AT-52L £150	Very Good Very Good	Holds its own on FM against many much more expensive tuners, but AM is very poor	All bands	BB	65
Akai AT-93L £250	Good+ Good+	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65
A&R Arcam Alpha £149	Good Average++	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB*	50
A&R Arcam Delta £270	Very Good Very Good	Hi-fi sound on FM, good on AM, a dependable British all-rounder	6AM, 6FM presets. FM/MW. LW display manual tune	BB	55
Denon TU 450L £130	Average+ Average+	Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation	FM/AM Digital MW/LW	R	50
Harman Kardon TU920 £299	Good Average	Rather weak sound quality for the price despite good lab test results	16 presets, AM/FM, digital auto scan, active tracking		55
Harman Kardon Citation 23 £559	Good Very Good	Fine performance, interesting features and ease of use are this tuner's forte, and the sound quality is top notch	FM/AM seek/manual adjustment muting 16 presets remote control	R	60
Hitachi FT-MD 5500 £200	Excellent Good++	A powerful, good sounding tuner with versatile facilities	16 presets, FM, AM, MW auto scan digital, signal meter	BB	55
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
Linx Theta £400	Good Very Good	A Magnum Dynalab on the cheap with the hallmark styling of this small British newcomer. Some of the best midrange from any tuner	Manual analogue tuning, no presets, signal strength meter	R	72
Magnum Dynalab FT101 £599	Good Very Good	Although expensive for its fairly minimum set of facilities its excellent sound makes up for what it lacks elsewhere	Analogue manual tuning, no presets, signal strength meter	R	72
Marantz ST35L £125	Good+ Average-	It works well enough but the sound could be better for the money	16 presets, AM/FM, digital auto scan, active tracking		55
Meridian 204 £525	Good+ Good	Pleasant sounding with a fine finish but does not make the grade at this price	FM only, auto scan, digital, remote, clock timer		55
Musical Fidelity TI £300	Good+ Very Good	Top class FM stereo sound on good signal strengths from this audiophile model. Watch out for local CB!	FM only, analogue box dial, manual tune, signal meter	R	55
NAD 4020 £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 tune digital		55
Onkyo T9090 II £590	Very Good Very Good	It has most of the facilities you could possibly want and more beside. Lab performance and sound quality are both good enough to ensure recommendation even at this price	FM only, digital, 20 presets, auto scan etc.	R	72
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
Sony ST-S300L/ ST-S100L £140/£100	Good Good	A reasonable entry point, not for difficult areas. AM - Poor	All bands	R	65
Sony ST 500ES £200	Good++ Average-	Disappointing sound quality but good lab performance. (Includes long wave)	10 AM/FM presets, auto scan digital		55
Sony ST-S 700ES £299	Very Good Very Good	First class in every respect including FM sound quality. Even AM was well above average	FM/AM, 10 presets, digital scan	BB	60
Yamaha TX-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 TX-500 £150	Average+ Average	Under a gaudy coat, this sensitive tuner gave reasonable stereo results. However, the AM had again been thrown down a well	20 presets (10 buttons) digital		50

Rating refers to original, tested model

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THE DIRECTORY

HEADPHONES

There are a variety of different approaches to headphone design, and examples of each turn up in this group. Amongst the more expensive esoteric models, electrostatic drivers are used in square open-backed phones such as the Jecklin and Stax models. The majority of these come with some form of transformer which takes the signal initially from the speaker terminals on the amplifier. The actual speaker cables then travel from this unit via a

bypass switch to the loudspeakers.

The more down to earth models feature dynamic drivers in circular open-backed designs. The advantage of open backs seems to be a correspondingly open sound and a less claustrophobic feel to the music. One can also of course hear external noises and irritate people on public transport.

The third category are closed-back designs,

which are useful in situations where it is necessary to block out background noise.

Another means of distinguishing different types is the way they sit on your head or ears. There are three styles: circumaural models enclose the ear and rest on the side of the head; supra-aural designs press on the outer ear (pinna); and intra-aural types rest inside the ear and are popular amongst users of personal stereos.

NAME PRICE	COMFORT SOUND	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Aiwa HP-X30 £30	Good Good-	A flashy personal stereo phone which alternatively could be used at home. A slight LF tonal preference slightly colours the response, but it ain't a bad can	Supra-aural, closed-back, dynamic		75
Aiwa HP-V99 £50	Good- Average+	Horn loaded in-ear miniatures with plenty of guts but not enough transparency or bass to compete with the headbanded competition	Intra-aural, closed-back, dynamic		75
Aiwa HP-X80 £50	Good Good	A headphone that's highly suited to non acoustic music and portable sources, nicely made and slickly finished. Sound quality doesn't quite match the price	Supra-aural, closed-back, dynamic		75
Aiwa HPEX-200 £90	Good Good	Modern looking and well finished the Excelsias, as they are dubbed, had meaty bass and sounded reasonably open for the type	Circumaural, closed-back, dynamic		63
AKG K135 £35	Poor Fair	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 K154/S £58	Good+ Good+	Electrostatic tweeters combine with a dynamic mid/bass unit to create very confident sounds in a comfortable headphone. Balance is on the bright side	Supra-aural, semi-open, electrostatic/ dynamic	R	75
AKG K240 Monitor £60	Very Good Good	Something of a classic these AKGs are very user friendly in all respects; sonically on the warm side of neutral	Circumaural, semi-open, dynamic	R	63
AKG K280 Parabolic £110	Good Very Good	A very revealing and unusual twin driver design that uses the same principle as a satellite dish to beam sound into the ear	Circumaural, open-backed, dynamic	R	63
AKG K340 £136	Good Excellent	Heavyweight cans in most respects, the K340 with its electrostatic tweeter is a very revealing headphone. Gives the total electrostatics a good run for their money	Circumaural, closed-back, electrostatic/dynamic	R	75
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	Average Good	The closed-back 910s are an improvement on the 909s with a nice rhythmic quality rarely found with headphones	Circumaural, closed-back, dynamic	R	55
Audio Technica ATH-911 £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	Very Good Fair	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	Good Poor	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £69	Good Good	On their own the 550s sound articulate with a slightly 'gritty' treble and 'keen' midrange; not suitable for headbangers!	Circumaural, semi-open, dynamic		55
Beyer DT880 £90	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £119	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing, neutral sound that is hard to criticise.	Circumaural, open-back, dynamic	R	55
Beyer IRS690 £200	Good+ Very Good	High quality infra-red headphones with soft comfy earpads and mellow but informative sound quality which is hard to dislike	Circumaural, open-back, dynamic	R	75
Jecklin Float Model One £79	Good Very Good	Whilst very unusual in appearance the Floats give remarkable sound quality and openness at a reasonable price	Circumaural-ish, open-back, dynamic	BB	55
Jecklin Float Model Two £99	Good Very Good	Helmet shaped and pretty unflattering but open sounding and comfortable in the long term. Note lack of adjustment means you should try before you buy	Circumaural-ish, open-backed, dynamic	R	63
Jecklin Float Electrostatic £399	Good Excellent	One version of the state-of-the-art, these electrostatics have an openness of sound rarely found in the breed, with good dynamic range to boot	Circumaural-ish, open-back, electrostatic	R	55
JVC HA-D990 £65	Good+ Good+	Good looking well made cans that offer good sound quality for the money. Sonic nature is of the easy-going, laid-back variety	Supra-aural, closed-back, dynamic	R	75
Koss TD/60 £20	Good Average	Although they're devoid of channel identification and have a decidedly Stateside approach to sound, these are very listenable phones for the price	Supra-aural, closed-back, dynamic		75
Koss K/6X Plus £30	Fair Poor	'Sixties-style' phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Pioneer SE-72 £30	Good+ Average-	Neat, nicely made personal stereo oriented phones along the lines of Sony V3s. Sound is on the veiled side, good for aggressive sources	Supra-aural, closed-back, dynamic		75
Quart Phone 30 £40	Good Fair	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	Fair Very Good	These more expensive Quarts bear a striking resemblance to the Jecklin Float models and use two drivers per ear. Sound is a bit bass heavy but not bad overall	Circumaural, open-backed, dynamic		63
Realistic Pro-X £25	Poor Average-	Robust, unanimously uncomfortable and heavily veiled in sonic terms - not a great success	Supra-aural, closed-back, dynamic		75
Ross RE2530 CD £20	Average Average	Rather an 'average' £20 phone that some found uncomfortable due to high pressure on the ears. Sonic balance is on the bright side	Supra-aural, closed-back, dynamic		75
Ross RE2560 CD £25	Good Average+	If you're not too fussy about quality of finish and don't have an elfin head then these British phones warrant attention. Sound could be smoother	Supra-aural, semi-open, dynamic		75
Ross RE-2760 £35	Poor Fair	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	Good Poor	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

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

THE DIRECTORY

HEADPHONES						
NAME PRICE	COMFORT SOUND	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW	
Sennheiser HD40 £18	Very Good Good—	Very light and comfortable headphones with an even sonic balance that will suit most sources, but jack is 6.3mm and not suited to personals	Supra-aural, semi-open, dynamic	BB	75	
Sennheiser HD450 £27	Good Fair	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	Good Fair	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 HD520 £60	Good+ Good+	A very comfortable and musically capable headphone. If you've got this sort of bread to blow on cans, give 'em a blast	Circumaural, semi-open, dynamic	R	75	
Sennheiser HD530 £70	Very Good Good+	One of the better dynamics in its group, the 530s create a sense of space that eludes most sub £100 cans, and they're dead comfy to boot	Circumaural, semi-open, dynamic	R	75	
Sennheiser HD540 Ref Gold £160	Good Very Good	The 540 Golds prove that dynamic headphones can be subtle, informative and capable of creating a remarkable sense of space	Circumaural, open-back, dynamic	R	55	
Sony A21L £20	Good— Good—	Forward facing in-ear drivers on a folding plastic band provide exceptional clarity for such an inexpensive phone. However, no bass, and fit isn't to everyone's taste	Intra-aural, semi-open, dynamic	BB	75	
Sony MDR V3 £30	Fair Good	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-V5 £50	Very Good Average+	A nicely made comfortable headphone let down by a limited ability to reproduce music in a natural fashion	Supra-aural, semi-open, dynamic		75	
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	
Sony MDR-CD999 £120	Good+ Very Good	A very nice headphone in all respects, the 999s are worthy of the best headphone outputs and high quality sources	Supra-aural, semi-open, dynamic	R	75	
Sony MDR-R10 £2500	Excellent Very Good+	Costly state of the art sealed moving coil design built to the highest standards using the finest materials. Sound quality reflects this care, being big, clear, sweet and refined	Circumaural, closed-back, dynamic	R	72	
Stax SR34 £140	Fair Very Good	The least expensive Stax headphones around, the SR34s are lively and rhythmic with good tight bass and a sweet midrange	Supra-aural, open-back, electret		55	
Stax SR84 £210	Very Good Very Good	The stepping stone between dynamics and full electrostatics, these electret phones are revealing, open and highly enjoyable	Supra-aural, open-backed, electret	R	63	
Stax Gamma pro/SRD-X pro £296/£230	Very Good Excellent	The Gamma pros are like a stethoscope for your hi-fi, revealing subtleties that many loudspeakers fail to resolve	Circumaural, open-backed, electrostatic	R	63	
Stax 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)	Very Good Very Good	A bit of an industry reference the Pros are frighteningly revealing, bringing across more information than loudspeakers costing twice as much	Circumaural, open-back, electrostatic	R	55	
Stax SR Lambda Pro £360/ SRM-1 energiser £635	Very Good Excellent	This combination extracts layers of information that other headphones only hint at. The SRM-1 has more edge than the SRM-T1, but it's good	Circumaural, open-back, electrostatic	R	75	
Stax Lambda Signature/SRM-T1 £470/£895	Very Good Excellent	The Signature when combined with the SRM-T1 valve driver must be the most transparent headphone available	Circumaural, open-backed, electrostatic	R	72	
Yamaha YHL-006 £30	Average Average	Unusual personal stereo oriented phones that curl up when not in use. Earphones are like golf balls and balance is well suited to Walkmans	Supra-aural, open-back, dynamic		75	

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	
Philips DG558 £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	
Sony Walkman Pro £249-£289	Good+ Very Good	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personals to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line BB in/out, varispeed		52/56	

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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 DPC-77 £270	Good+ Very Good	Very chunky and well made, the DPC-77 is the only player to include a digital output and sounds very good through its analogue output – a suitable domestic alternative	12.8 x 3.5 x 14.5cm, 750g, digital output, mains & in-car adaptors	R	66
Philips DG800 £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-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, mains adaptor	R	66
Xenon CDP-03 £180	Average— Fair+	A well made and competitively priced machine that is ergonomically spoilt by flat slightly unresponsive buttons. Sound quality ain't too bad but a trifle boring	12.6 x 2.7 x 12.6cm, 560g, high frequency filter, key lock		66

CD PORTABLES

CD Portables or Yuppie Blasters as we classified them are basically portable stereos gone digital, ie a compact disc player is included alongside the usual AM/FM radio and single or double cassette deck. Compact disc is a novelty that seems to add a fairly hefty premium onto the price of the standard ghetto blaster, but the improved sound quality over standard cassettes may justify this for some. In virtually every case a CD output socket is

fitted which means that it's possible to play silver discs through a domestic amplifier and loudspeakers, thus they are some sort of substitute for standalone mains machines (as are the personal CD players). One drawback with having a CD player on board is that batteries are gobbled up even quicker than usual, up to ten batteries being required in some cases. Neither are the units particularly light, the heaviest weighing eight kilos!

However they do all run off the mains too, and come with an appropriate lead for this purpose. Other useful features common to most are spare input sockets to record from an external line source such as a preamplified vinyl disc signal, and microphone sockets for recording live events (although the usual lack of record level adjustment is a nuisance).

MODEL PRICE	SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa CSD-XL25 £150	Poor	It's cheap, cheerful and not too low on features but sound quality from disc is frankly uninspiring	Twin headphone sockets		73
Bose Acoustic Wave £750	Very Good	Not exactly a CD portable as it doesn't play discs, but a highly versatile and stylish radio cassette player that has bass	Input sockets, Dolby NR, PA capable etc	R	73
Grundig RR9000CD £300	Average	Relatively slick machine with full CD function and volume remote control, low on features for price and unspectacular sounding	Remote, motorised volume pot, condenser mic		73
Philips AZ8394 £200	Average—	Stylish in a wasp like fashion, unfortunately the disc playing lets it down somewhat but otherwise it's OK	Twin decks, graphic eq., bass boost, condenser mic		73
Sharp QT-CD43 £280	Average	Quite a beely box that comes complete with remote control for volume and CD functions. It even has a surround sound option which enhances imaging	Clock, speaker outputs, powered volume pot		73
Sony CFD-073 £280	Good	The model we received was intended for the Japanese market and thus may not be entirely representative but it made reasonable sounds and has novel features	UHF bandwidth, input sockets, graphic eq., Megabass	R	73
Sony CFD-DW83 £300	Average	A macho looking beast capable of highish levels, but unimpressive sound for the price. Nice styling and good for scratching	Clock, timer, balance, input sockets, graphic eq.		73
Toshiba RT-8089 £200	Poor+	Square and long but rather drab on the sound quality front, as well equipped as most but rather tinny in many respects	Clock, twin decks		73
Toshiba XR-9458 £250	Average+	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	420g, 2 remotes, mains adaptor, 3" ready etc.		73

STANDS AND SUPPORTS

It's becoming more and more apparent that all the components in a hi-fi system benefit from being placed on the right kind of support. It is already acknowledged that performance of electro-mechanical transducers, such as turntables and loudspeakers, can be greatly improved by using highly rigid supports. This notion has been expanded to include electronics such as amplifiers and compact disc players, and inevitably a broad range of stands and supports have been produced to cater for this requirement.

With loudspeaker stands there seems to be two

broad schools of design. The most common is the open frame type which uses square section steel tubing (usually less than an inch square) made up to form a tripod or quadropod stand usually fitted with spikes top and bottom to ensure good coupling to both floor and cabinet. However, for reasons of domestic harmony this latter option is often not pursued as eagerly as perhaps it should be. The alternative approach is to use mass. Larger section (approximately 3 inch x 2 inch) tubing is welded between square top and bottom plates and filled with sand and/or lead shot. Again, this type uses

spikes at the base but Blu-tack or the like for coupling with the speaker cabinet.

Equipment supports generally place isolation quite high on the list of priorities and usually use a lightweight steel frame to support an MDF platform. Once again spikes are used to minimise contact with the platform and ensure good coupling to the floor. Minimising weight without compromising rigidity seems to be the aim with turntable supports but those designed for electronics often employ some form of damping to kill vibration, sometimes in the form of mass.

LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Appolo A820 £40	4 leg Fair	A light open-framed budget design slightly lacking in rigidity and subjectively superseded 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

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LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Heybrook HBS1 £75	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speakers own 'sound' to remain intact.	23 x 21cm 47cm	R	58
Linn Kan II £79	4 leg Very Good	Built to support Linn's Kan speaker this stand is well suited to the task, but is less successful with other loudspeakers.	19 x 16cm 59cm		58
Linn Sara £85	4 leg Very Good	The Sara exhibits some odd properties so its use other than with the Sara loudspeaker should be viewed with caution.	25 x 21cm 53cm		58
Monotrak Engineering M1 £58	1 leg Good	The M1 gave the mid and treble a commendably smooth and detailed presentation but bass sounded rather lacklustre and muddy.	19 x 18.5cm 48cm		58
Monotrak Engineering M4 £58	4 leg Very Good	Begging comparison with Heybrook's HBS1 the M4 maintained much of the openness and forthright detail of that model.	23 x 21.5cm 53cm	R	58
Monotrak Engineering M4S £58	4 leg Very Good	Its stature and stability would seem to mark it out as most suitable for smaller, lighter cabinets. The M4S possessed an open midband and clear treble.	20 x 17.5cm 53cm		58
Mordaunt-Short IST 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 unmuddied.	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 gumpdrops are very useful for damping vibrations in amplifiers and especially CD players.	6.5 x 2.5cm (circular)	R	57
Cornflake TCSS £50	Table Very Good	A little too close to the ground for comfort, perhaps, but this novel and stylish little table is certainly worth seeking out.	29 x 43 x 33cm	R	57
Cornflake TCS6 £50	Shelf Good	A squat and rigid frame supports a Medite top board with four adjustable spikes, better suited to suspended sub-chassis turntables.	43 x 23 x 33cm		57
Deltac Isolation Base £135	Platform Good	Designed for all CD players, amplifiers and separates, but not suspended sub-chassis turntables, the isolation is second to none.	50.5 x 40cm	R	57
RATA Model A £125	Table Very Good	A three-legged Torlyte turntable support that has become something of an industry reference.	46 x 46.5 x 38.5cm	R	57
RATA Amplat £40.25	Platform Very Good	A lightweight and rigid Torlyte slat with spikes for floor or shelf mounting, it works well in conjunction with the Target TT2.	4 x 44.5 x 35cm		57
Sound Organisation Table £55	Table Very Good	A deceptively simple structure that just happens to be engineered in a thoughtful, and ultimately successful manner.	37 x 45 x 35cm	BB	57
Sound Organisation Wall Stand £40	Shelf Very Good	The first of its ilk and still amongst the best, this simple framework represents a vast improvement over standard furniture shelves.	27.5 x 43 x 35cm	BB	57
Target TT1 £46.50	Shelf Excellent	This rigidly braced shelf offers both good sound quality and material value for money.	26 x 46.5 x 35.5cm	BB	57
Target TT2 £47.50	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'.	52 x 46.5 x 35.5cm	BB	57
Townshend Suspension Base £145	Platform Fair	Designed to complement the Rock turntable, this platform will bring subjective improvement to a wide range of electronics.	43 x 36cm	R	57

CABLES AND CONNECTIONS

Although cables and connections are sometimes thought to be the least important items in an audio system there has been a growing awareness in recent years that they have a significant effect on sound quality. To this end there is now a vast array of exotic cables and interconnects available to those interested in experimentation. The key observation on cables is that they are much more than mere accessories. Carrying the audio signal, just as any amplifier does, it's really not too surprising that they can influence the quality of that

signal.

The characteristics of any cable are determined by the materials and topologies utilised in its construction. The purity of the conductor, nature of the insulator dielectric, mechanical construction, physical geometry, RF characteristics, efficiency of screening and finally the connectors themselves, all play vital roles in the sonic character. These factors tend to vary more with interconnect cables which are used to carry the signal between active components like pre and power amplifiers. The

interconnects summarised here were tested in 1m terminated lengths and therefore the results and prices relate to that length - some cables may well perform differently when used in longer lengths.

The features column contains information on the material make-up of the different cables with the following abbreviations: OFC - oxygen free copper, OFHC - oxygen free high conductivity (Audionote define the HC as high crystal), PC-OCC - pure copper by ohno continuous casting, LC-OFHC - linear crystal oxygen free copper.

INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Apature LSD N/A in UK	Poor Fair	Faint resonant boom was audible at very low frequencies, but otherwise this cable sounded remarkably neutral.	Silver plated copper, PTFE dielectric		59
Audioquest Reference 2 £29	Good Fair	Ultimately Reference 2 simply damped much of the atmosphere and emotional charge of a musical performance.	OF copper		59
Audioquest Livewire Topaz £29	Good Fair	Sounding 'bigger' and faintly richer than Reference 2, Topaz was also slightly grainy at the top end.	Gold-plated plugs, OFHC copper		59

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INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Audioquest Livewire Ruby £45	Fair Good	Smoother sounding than the Topaz, the extended crystal Ruby is less grainy and coarse, better able to resolve complex passages.	FCL copper twin axial	R	59
Audioquest Livewire Quartz £65	Good Good	Quartz has an ideal, neutral balance that embodies sparkling clarity without the drawbacks of harshness or compression.	3 piece plugs, PTFE dielectric	R	59
Audio Technica AT6115 £50	Very Good Fair	This cable sounds somewhat 'quieter' than the original LC-0FC interconnect, but is also less transparent and three dimensional.	PC-0CC 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 Very Good	ANS scored a hit with its transparent midband and revealing but quite unforced treble quality. Bass transients were slightly softened.	Silver signal & Copper screen	R	59
Audionote Silver ANV £140	Poor Very Good	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
Deftec 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
Deftec Black Slink £152	Excellent Excellent	Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of tactility.	8 silver plated OFC strands PTFE dielectric	R	59
Denon LC-0FC 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-0FC, non-magnetic gold plated plugs		59
DNM Solid-core £15-£25	Fair Good	Transparent in the midband and full of sparkling detail in the treble, low bass was slightly curtailed (unterminated price £2.30 per m.)	Single strand nickel-plated copper. Unshielded	R	59
Kimber Kable PSB £32	Very Good Very Good	An exceedingly transparent midband but slightly 'clanky' treble. It always managed to sound remarkably uncluttered and open.	OFC, PTFE dielectric	BB	59
Kimber Kable KC-1 £47	Very Good Fair	Tonally faintly leaner and brighter than the more open-weave PSB, KC-1's treble detail was just too sharp and grainy.	Multi-gauge PTFE dielectric		59
Kimber Kable KC-AG £375	Good Very Good	Treble detail resolution was perceived in a slightly abrupt if wholly controlled fashion. Depth re-creation and lateral separation were excellent.	Multi-gauge silver, PTFE dielectric	R	59
MDM Interconnect £14.95	Good Fair	The subjective performance of MDM did appear a little imprecise at the frequency extremes, but a worthwhile upgrade on budget interconnect.	Coaxial, solid core, gold plated plugs		59
MIT PC-Squared £75	Fair Good	This multi-gauge cable produced a very open and buoyant midband but sounded slightly 'peculiar' at frequency extremes.	OFC, multi-gauge	R	59
MIT Spectral MI330 £193	Poor Fair	MI330 displays a marvellously open and enticing midband quality, bass is warm and rich but this character has a tendency to dominate.	Multi-gauge balanced bandwidth		59
Monitor PC 0100381 £17	Good Fair	There is more than a hint of instrumental muddling and bass is slightly soft, however, the slightly 'shut-in' sound is par for the course at the price.	OFC, coaxial	R	59
Monster Interlink 400 £30	Good Good	Bass is solid and punchy, counterpointed by a slightly overblown midband which tends to make vocalists sound larger-than-life.	Multi-gauge	R	59
Monster Interlink CD £44	Fair Fair	Low frequency is commendably weighty, but the top-end sounds vague and lacking in image focus. Suited to some systems better than others.	Multi-gauge		59
Monster Interlink Reference £88	Good Fair	Protracted listening indicated a lack of dynamic speed - a subjective sluggishness. It may prove well suited to up-front systems.	Multi-gauge Balanced bandwidth Gold plated plugs		59
Myst Tm £15.60	Fair Good	Fairly neutral with a pleasantly open and transparent midband. Some deep bass detail is lost but treble is sharply focused.	Solid-silver PTFE dielectric	BB	59
Origin LiveSofi-Core Super £60	Good Fair	Improves over previous Sofi-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-C31DES £40	Excellent Good	Possessing deep firm bass and a sparkling top end it offers a balanced perspective with negligible coloration.	Coaxial LC-0FC	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
Van den Hul MC-D300II £59	Poor Good	It tended to highlight some upper mid detail, but a generally open and spacious acoustic proved its saving grace. Slightly soft at LF.	Silver plated single strand VdH plugs	R	59
Van den Hul MC-1021II £69	Good Good	Possessing the same endearing qualities as the D300 it presented open and transparent soundstages and improved timbral resolution.	Twin axial silver plated copper	R	59
Van den Hul MC-D502 £77	Fair Fair	The tonal balance was 'tilted' by a strong and authoritative bass line, which had the knock-on effect of muting treble detail. A bit dear.	Twin axial silver plated copper, teflon dielectric		59
Van den Hul Thunderline £147	Good Fair	Thunderline essentially parallels the sonic performance of the cheaper D102. HF is occasionally tainted by a 'tizzy' coarseness, bass is tight and dry.	Silver plated 'matched copper'		59
Van den Hul MC-Gold £247	Fair Good	It possesses a rich and beguiling treble balance that matches a weighty, slightly warm bass character. Seductive balance may prove worthwhile in some circumstances.	Silver & gold plated copper		59
Van den Hul MC-Silver £747	Good Good	Although remarkably transparent for an asymmetric design this costly cable was not considered to be of 'state-of-the-art' standard, and is bettered by cheaper models.	19 silver plated copper strands		59
Vecteur 8045 £49	Very Good Good	Sounding solid and forthright it might seem slightly cold in some systems but the treble 'edge' is mercifully clean. Very low frequencies were a little lacking in 'slam'.	LC-0FC signal & screen	R	59

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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— Very 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-OFHC cables this PC-OCC derivative sounded smoother and less aggressive	PC-OCC, PVC dielectric		64
Bellwire 12p per metre	Poor Average—	Broadly speaking it delivered a bright and tizzy sounding treble with a fairly open and detailed mid with little or no bass resolution	0.5mm single strand, PVC dielectric		64
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	A good general-purpose solid-core, though too bandwidth limited for high-end applications. Sounds great in some systems	0.65mm single strand, webbed PVC dielectric	R	64
Exposure £2 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs	56 OFC strands, webbed PVC dielectric	R	64
Kimber Kable 4PR £49.45 – 5m pair	Fair Fair+	This directionally marked cable benefitted from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut	4 x 7 copper strands per conductor, PVC dielectric		64
Kimber Kable 4TC £16 per metre	Good Good+	4TC made a great impression in the listening tests with an open midband, a smooth and unfatiguing treble with slightly rich but suitably weighty bass	OF copper, PTFE dielectric	R	64
Linn K20 £2.20 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 unfatiguing 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-OCC strands	R	64
Naim NAC-A4 £2.25 per metre	Good Fair+	Tinged with brightness while the deep bass response seemed both over heavy and poorly integrated compared to the immediate competition	Multistrand, webbed PVC dielectric		64
NVA £6 per metre	Average+ Good	A light and breezy sounding cable best suited to short lengths, NVA benefitted from a clear and transparent outlook	7 x 0.25mm silver alloy strands, PTFE	R	64
Origin Live Soli-Core Ordinary £1.80 per metre	Good Fair+	Subjectively it bettered the performance of the costlier Super version, affording a pleasantly detailed and spacious soundstage with firm bass but slightly coarse treble	1.8mm and 0.5mm single strands	R	64
QED 79-Strand 90p per metre	Good Fair	For much of the last decade QED 79-Strand has been the first port of call for enthusiasts on the upgrading ladder, a tradition that should still hold true today	79 strand, PVC dielectric	R	64
QED Incon Graphite £1.75 per metre	Fair+ Fair+	This graphite version of Incon sounded cruder and generally more heavy handed than the cheaper unshielded type. Overall presentation was mildly restricted and cloaked in a faint aural fog	OFHC, polymeric screen		64
QED Flat 200 £1.95 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive	200 strands, flat webbed PVC dielectric	R	64
Rotel Supra 4 £2.49 per metre	Good+ Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unfatiguing treble	1,036 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 10 £6.49 per metre	Good+ Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Sony RK-S5ES £59.95 – 5m	Fair+ Fair+	The sound of this cable was also somewhat controlled and over damped. The treble was relatively free and airy but lower octaves, including the midband, were constrained	350 x 0.08mm OFC strands, heat shrink dielectric		64
Solid core mains cable 36p per metre	Fair+ Good	It enjoys much of the smooth treble and articulate midrange usually associated with the better solid core derivatives. Lean but taut and rhythmically coherent	1.5mm square, 3 cores, PVC dielectric	BB	64
Sterling £499 – 5m pair	Fair Fair	This pre-production sample possessed a strangely muddled and reserved sound quality. It suffered from a progressive instrument modulation that totally confused more complex orchestral passages	Pure Silver, PTFE dielectric		64
Townshend Isolda £400 – 5m pair	Fair+ Good	Isolda possessed a truly dark background out of which rose a very solid and extended bass together with an excellent sense of transparency through the upper octaves	8 coax cables per conductor – very thick	R	64
van den Hul CS-122 £5.50 per metre	Fair+ Good—	Characterised by a driving and powerful bass, CS-122 proved to be a heavy sounding cable. Mid treble detail was refreshingly clear but there was a slightly muted air about the extreme treble	19 x 0.45mm silver plated strands, webbed rubberised dielectric	R	64
van den Hul CS-352 £12.95 per metre	Good Fair+	Subjectively it sounded like CS-122 only more so, the deep rumbling bass tending to overwhelm subtle musical details. It also appeared a trifle peaky in the treble	7 x 0.76mm + 168 x 0.125mm silver plated strands, rubberised dielectric		64
van den Hul SCS-12 £29.95 per linear metre	Good+ Good+	SCS-12 set a high standard with a tight and well focused soundstage populated with tactile stereo images. Bass wasn't as extended or resolved as some other cables	19 silver plated strands of 12 different gauges, PTFE dielectric	R	64

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THE DIRECTORY

LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
van den Hul SCS-2 £99.95 per linear metre	Good+ Good+	Overall it was commendably neutral and transparent but nothing less would be acceptable bearing in mind the tremendous cost of a stereo pair	665 silver plated matched crystal copper strands, PTFE dielectric	R	64
Vecteur R-CV30 £4.99 per metre	Fair Good	Subjectively the better of Vecteur's three-strong cable line-up offering a neutral overall perspective but with a slight loss of detail resolution at both frequency extremes	4 x 0.8mm LC-OFC PTFE insulated strands	BB	64
Vecteur S-CV90 £199 - 5m pair	Fair+ Fair+	It seemed both less transparent and integrated throughout the midband than R-CV30, though both frequency extremes were spruced up with a tighter sharper delivery	6 x 0.7mm LC-OFC strands		64

IN-CAR ENTERTAINMENT

In-car entertainment is an area not usually associated with the esoteric world of domestic hi-fi. However, it represents a source of musical entertainment that many of us are exposed to every day. The majority of new cars are fitted with some form of radio before they leave the showroom and in many cases this usually very basic player is taken for granted and accepted as representative of in-car audio standards.

For the price of a budget amplifier or more, there is a wide variety of in-car machines to choose from,

including cassette, CD and even DAT players. The majority of sub £300 players are integrated units featuring a cassette player, AM/FM tuner and amplifier, all in one remarkably compact standard sized box. At this price level the cassette players tend to be fairly basic affairs, although autoreverse and noise reduction systems are both fairly common. Tuners are usually of the digital variety with varying degrees of sophistication in signal tuning and presetting, with some machines featuring as many as 18 FM presets. The emphasis is on the frequency

modulated band and AM often suffers as a consequence, but fortunately for radio enthusiasts there are some exceptions.

The amplifier is usually designed to drive two pairs of speakers mounted fore and aft of the vehicle, and a fader is fitted to adjust the balance between the two. The dearer machines feature separate bass and treble controls which can be quite handy given the unusual acoustic of the car environment and the variety in balance and presentation to be had from car speakers.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Alpine 7282L £250	Good Very Good	A very attractive and seductive sounding player. The matt surfaced transparent preset keys are especially sexy	Bass/treble controls, 12 FM 6 AM presets, chrome eq., clock, 8W	R	61
Alpine 7905M/3539 £650/£350	Excellent Excellent	An easy to use and attractive CD/tuner, partnered with a powerful and flexible amplifier to give an effortless source of in-car entertainment	Bass/treble controls, 12 FM, 12 AM presets, slide-out, 150W	R	68
Blaupunkt Windsor SQR 38 £275	Good Average	Not very enthralling sonically, the Windsor is rather low powered but does have a reasonably stable tape transport	5 FM, 10 AM presets, 3.1W		62
Clarion 916HP £160	Good Average	With its rubbery buttons and touches of white this is a modest looking player let down by a weak cassette	Bass/treble controls, 5 FM, 5 AM presets, 9W		61
Clarion 946HP £250	Very Good Very Good	A good FM side let down slightly by AM performance. This Clarion is particularly nice to use with its nifty SAM tuning system	Bass/treble controls, 12 FM/6 AM presets, slot-in, 15.1W	R	61
Clarion CDC7000/10028HA £650/£250	Very Good Excellent	Despite a slightly off-beat cartridge system the Clarion combo put in a performance that had the sonic edge over other CD/tuners in its test group	Bass/treble controls, 12 FM, 12 AM presets, security code, 80W	R	68
Goodmans GCE229 £150	Fair Average	If knobs, switches and legends are your bag then the GCE229 is the one for you - a lot of gizmos for the price and it even sounds OK	Bass/treble controls, 6 FM/6 AM presets, Chrome eq., clock, MSS, 10.1W	BB	61
Hitachi CSK-402E £250	Good Good	An attractively designed little player that for once doesn't disappoint when it comes to playing music, and it even has a security system	Bass/treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., music search, 7.4W	R	62
Nakamichi TD-400E/PA-300 II £495/£329	Very Good Very Good	If you want your in-car entertainment to compete on sound quality grounds with your domestic system, this combo offers a very strong challenge	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, chrome eq., Dolby B, C, 75W	R	62
Nakamichi TD-700E/PA-300II £874/£329	Very Good Excellent	For those who appreciate the wonders of analogue there are few in-car players to really compete with this superb cassette/radio. You can even adjust azimuth	Bass/treble controls, 6 FM, 6 AM presets, music search, Dolby, 75W	R	68
Panasonic CQ-497 £117	Fair Poor	The CQ-497 has a traditional style analogue tuning system making it easy to use. AM reception was good but the other sources are less encouraging	Bass/treble controls, chrome, NR, 7W		62
Philips DC680 £180	Average Good	A colourful and musically competent player that despite a gammy volume knob is well worth checking out.	8 FM, 4 AM presets 3.5W	R	61
Pioneer DEX-M300/COX-M100/ GM-3000 £300/£450/£280	n/a Very Good	Separate control unit and boot mounted multi play autochanger make this a bit of a hefty installation but it uses the same magazines as their domestic players and sounds fine	Bass/treble controls, 18 FM, 6 AM presets, 80W, removable fascia		68
Proton 214CD/D275 £300/£175	Very Good Very Good	This Proton cassette/tuner offers good power and a level of fidelity appropriate to its price. Musically it has a Decca-like charm that is very appealing, plus a sensitive radio	Bass/treble controls, 8 FM, 8 AM presets, Dolby B/C NR, chrome eq., 85W	R	68
Sharp RG-F816E £200	Poor Average	Nothing if not novel the 816, with its unusual anti-theft system is custom built for the furry dice brigade, but is sonically a bit lacklustre	Four band graphic, 8 FM, 16 AM presets, ASP, Dolby, MSS, 10.9W		62
Sharp RG-F882E £220	Average Average	Again a glitzy full feature machine with a flip out control panel and plenty of lights. However, sound quality is a bit disappointing	Seven band graphic, 5 FM, 10 AM presets, ASP, chrome eq., Dolby, 8.5W		62

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RECEIVERS

Purists will look down their noses at the very idea of combining two functions into one box, and indeed they always have done. But unless we're talking about the exotic elite, the creme de la creme of amplifier and tunerdom, intrinsic technical shortcomings simply aren't an issue.

One obvious reason why you should buy a receiver if you were otherwise considering an amplifier and a tuner is that there are savings, ie of

size. Generally you end up with one box in place of two similarly sized boxes, which has got to be a good idea. Receivers are also simpler to operate, in principle anyway. At the very least you save on one power switch, and typically you are presented with an integrated control system that is bound to oil the wheels of ergonomics.

But there is one important point to watch. Because receivers don't sell in vast quantities in

this country, and because this is one of the very few countries to use Long Wave for public service broadcasting, many – no, most – receivers on sale in this country cover FM and MW only. Remember that LW is the home of Radio 4, where it can be heard on the all too frequent occasions it is not on FM.

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Harman Kardon HK330Vi £259	Average Average—	No LW, and FM section best suited to strong, local transmissions. The amplifier is quite powerful but favours the treble. Bass is tuneful but lacks weight	5 inputs (inc 2 tape), FM/MW tuner		70
Harman Kardon HK440Vxi £299	Good Good	Clear, dynamic, slightly bright sounding design, a little grainy in extremis. Mono switching and LW missing from tuner, which otherwise performs well	5 inputs (including 2 tape) with FM/MW tuner	R	70
JVC RX-777VL £500	Good Good	Sharp, lively but euphonious sound quality from line and phono source is matched to a high grade tuner. However, many half-baked facilities blunt value for money	A/V capable with 6 inputs, equaliser, digital ambience, FM, MW/LW		70
JVC RX-1001V £770	Average Poor	Power output is well below spec, and sound quality is cluttered and messy on all inputs	Digital ambience processing, Dolby Surround, 2/4 speaker, 40 FM/MW presets		70
Revox B285 £1782	Average Average—	Sophisticated and capable tuner is married to a muddled, compressed sounding amplifier, which also has low sensitivity preventing the amplifier being driven fully in many situations	70 watts/ch, 4 inputs (inc 2 tape), 29 FM/MW/LW presets		70
Rotel RX-850AL £230	Good Good	Well built and sensibly equipped receiver with outstanding sound quality for the price via the tuner, phono and line sources alike. It majors on subtlety however, and may not impress the heavy metal brigade	4 inputs (inc 1 tape), FM/MW/LW tuner BB		70
SAE R102 £599	Average— Average	This is an uneven but mostly good performer. It sounds constrained but musical, but the tuner is weak on both wavebands.	4 inputs (inc 2 tape), FM/MW tuner		70

VIDEO RECORDERS

For some time there's been a move to improve both the video and the audio quality of video recorders and TV sets alike as a necessary prelude to a proper integration between the two. Hi-fi video is obviously an important element in the story, and so is Dolby Stereo, the ambient 'surround sound'

system. The weak link of course is on the broadcast side. Although TV sound is well up to normal hi-fi standards, it has always been in mono and unjustly or otherwise has rarely attracted much audiophile interest. But TV sound is – or shortly will be – freed of the shackles of mono by the introduction of NICAM

stereo. NICAM – an acronym for Near Instantaneous Companding and Modulating – is the missing link that will help facilitate the much feted integration of video with audio. And then we have S-VHS, a system which does for picture quality what the other developments promise to do for the sound...

NAME PRICE	LAB SOUND & PICTURE	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai VS-75EK £550	Average Good	Excellent performance and a slick set of controls make this recorder a pleasure to use. Good price is a bonus	Hi-fi, NICAM, programmable remote	BB	71
Akai VS-77EK £700	Average Good	Another fine and carefully designed model from the impressive Akai video stable. The Dolby installation, whilst flawed, is certain to increase interest in the system	Hi-fi, NICAM, Dolby Surround decoder & stereo amp	R	71
Ferguson FV33H £500	Very Good Below Average	Beer budget NICAM has excellent tape search facilities and an intelligent remote control. Neither picture nor sound quality however are state of the art, and ergonomics are poor	Hi-fi, NICAM, transmitter LCD remote control		71
JVC HR-D750EK £500	Good Average+	Well sorted and relatively affordable NICAM recorder with LP sound only. It is pleasing to use and helpfully equipped, especially when trying to find individual recordings buried in long tapes. Performance is good in relation to price	Hi-fi, NICAM, transmitter LCD remote control	BB	71
JVC HR-S5000EK £1000	Good Very Good	This is the first domestic S-VHS recorder on the market, and it's an unusually well designed one with a wide range of well sorted features and controls. Sound and picture quality are close to state of the art, and miles ahead of any non-S-VHS recorder	S-VHS, Hi-fi, NICAM, LCD remote	R	71
Mitsubishi HS-B70 £1000	Very Good Very Good+	Superb model, and true state of the art picture quality, though you'll need a high grade S-VHS compatible monitor to reap full advantage. The facilities are also wide ranging and generally helpful	S-VHS, Hi-fi, NICAM, LP & SP, programmable remote	R	71
Nordmende V4405K £799	Good Good	Fine basic sound and picture quality, but the RF convertor introduced significant losses. An excellent model, but configured for German home market. VPS compatibility is of no practical use here, and the recorder lacks NICAM	Hi-fi, transmitter handset, digital FX		71
Panasonic NV-FS1 £1000	Poor Good	The control system is poorly organised, with cramped legends and some strange machine logic. Bar code programming is hardly a great achievement either. Picture and sound quality are good, but not state of the art	S-VHS, Hi-fi, NICAM, bar code programming		71
Sanyo VHR-D4710E £900	Very Good Good	Fine colour and moderate detail make for a basically good video section to match a fine sound section. Some of the facilities are a little disappointing however and the deck looks expensive	Hi-fi, NICAM, infra-red headphone remote, digital FX		71

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PERSONAL MESSAGES

Still recovering from the arduous task of testing ten TV sets, Paul Messenger discusses the pros and cons of NICAM reception.

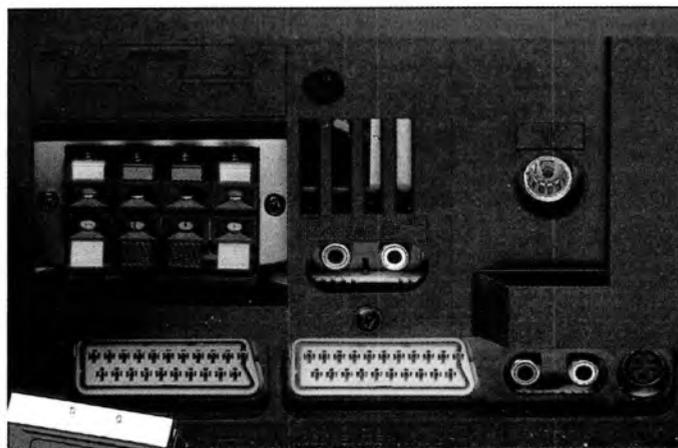
Briefly losing my presence of mind, I foolishly submitted to Trial by Ordeal some six weeks ago. Ten television sets were supposed to be on trial of course; the ordeal came in shifting them around and finding room both for the sets (which don't stack like loudspeakers) and the Wendy House size packing cartons (which do).

I was already well into the project before some of the implications really sank in. One of the most interesting was that I had almost inadvertently assembled some ten different executions of NICAM digital stereo TV sound decoding, from eight different manufacturers. Duty and personal curiosity both demanded some careful comparative listening.

Which is actually easier said than done. There's no straightforward way to A/B test NICAM stereo as such, because it is by nature a broadcast signal. It can be simulated in the lab with a couple of suitcases full of advanced electronics, but you certainly can't hire or borrow the equivalent of an FM signal generator in order to control and repeat a top quality source. And the NICAM broadcasting that was going on in August '89 was definitely 'experimental/test' as far as the broadcasters themselves were concerned, with little stereo content.

My first thought was to compare NICAM TV sound with FM TV sound, something easily enough achieved from my base by tuning the TVs into both the Crystal Palace (NICAM alongside FM) and Dover (FM only) transmitters. But it's pretty difficult to compare mono versus stereo in any meaningful way, especially when it's obvious that a quite different mixdown has been used. And even when the NICAM signal was only being used for mono purposes, there was certainly some evidence of different equalisation in operation, and frequently significant level differences too.

Belatedly and almost accidentally, I stumbled across the alternative strategy of using the BBC's TV/FM simulcasts – specifically the Proms and Top of the Pops. I still can't guarantee that both the NICAM and FM feeds are the same (up until their quite different transmission



paths that is), but I can't see why the BBC would bother to do two separate stereo mixes as well as a mono one, and the two certainly sound similar in balance terms.

It isn't fair at this stage to attempt to make any definitive judgement about the capabilities of NICAM itself, simply because it isn't yet a service. Until that status is formalised, the broadcasters can pump out what they want to. But the best I've heard has been quite promising, if lacking a little of the delicacy and transparency of my FM link.

This is not too surprising, given that the FM is being received on a £1,000+ tuner and £150 aerial in virtual line of sight of Wrotham, whereas the NICAM reception is handled by a £50 chip set built into a domestic TV set running off a conventional enough antenna.

The stimulus that got me trying to track down NICAM sound quality was the Philips 5574 CTV. I'd been happily enough feeding my hi-fi from a Ferguson FV39S VCR on and off for several months, but persuing the Philips manual revealed the phono audio output was most thoughtfully taken off after the remote volume control (a switch disconnecting the internal speakers).

With some enthusiasm I drafted in the 5574 for TV sound source duties, but was disconcerted to find it not at all to my subjective taste. There was all the scratchy, 'edgy' quality one has come to associate with poor digital audio reproduction – characteristics which are not necessarily down to the digitisation per se, I should add.

I was about to consign the

Philips to its carrier bag when I remembered to check out its SCART socket. (SCART protocol takes the audio-out signals directly from the tuner, ahead of other audio circuitry.) The 5574 redeemed itself with a sound which was much sweeter and more acceptable than the variable phono output, if a shade lacking in welly.

The ITT 3578 is the other NICAM TV with remote controlled phono outputs, and was thankfully free from the HF problems of the Philips equivalent. Though convenient to use, the sound was still somewhat unsatisfying, sounding bandlimited and lacking transparency; SCART sounds more transparent but also a little more coloured.

Whereas the NICAM VCRs deliver line level stereo audio as a matter of course, only three out of eight tellys have this feature (the third being the fixed output Ferguson). A number have extension loudspeaker sockets, which is handy for standalone applications, but far too agricultural an approach for a high performance hi-fi. However, it is still possible to get at the NICAM via the SCART/Peritel/Euroconnector socket, so an attempt was made to compare the various sets by this means, even though this may not be the most convenient route for the user.

As mentioned, the SCART feed comes from close to the tuner itself, and in some of the sets it is clearly ahead of the muting circuitry which compresses pops and bangs during channel changing. But my suspicions had already been aroused over the hi-

fi qualities of TV audio circuitry, and I suspect it's not entirely accidental that two of the better sounding NICAM outputs were those that lacked these fairly elementary cosmetic benefits.

Both Hitachi and Mitsubishi sets were unusually transparent to the signal, but both suffered from muting (and in the case of the Hitachi, level ducking) deficiencies. Which is a problem that does not afflict the Mitsubishi HS-B70 VCR.

The sources are not reliable enough to draw firm conclusions or fine distinctions, but my favourites were the two (c£1,000) S-VHS VCRs and Panasonic's *Prism* telly. I found the Ferguson TV a shade untidy and 'grainy', the Grundig a little 'rich' and 'warm', and the Sony a bit bandlimited and 'quacky', though the latter's preproduction status renders this finding tentative.

To my ears there's significantly greater variation between these different NICAM applications than between an equivalent selection of CD players. And even the best still fall somewhat short of specialist hi-fi standards.

One contributory factor is clearly that the circuitry has been executed in a TV/VCR context – a design and manufacturing tradition which is geared towards highly cost effective products, but which has always been a world apart from the best hi-fi practice.

The £50-£100 NICAM premium for built-in or update/retrofit circuitry to new or recent stereo CTVs and VCRs looks a very good deal for anyone in the signal reception area, though the low price does perhaps reflect the rather limited programming which broadcasters are likely to make available during the start up period.

Those impatient to get into NICAM should perhaps investigate VCRs as more hi-fi compatible than CTVs, though I have had no experience of the newer £500-600 models which have started appearing recently. Those who are prepared to wait are likely to find more expensive (?c£200), but more hi-fi specialist oriented NICAM/TV 'tuners' appearing on the market in due course, as a step on the route to A/V integration.

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