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MENU

When *Choice* was testing cassette decks this time last year, we suggested that design engineers who had been planning to work on digital audio tape (DAT) recorders, would be turning their attentions back to analogue cassette decks. Indeed, we have seen some improvements in the quality and performance of cassette decks during the past twelve months – particularly in low-cost twin decks, curiously enough – but what's going to happen next? Dolby S circuitry, explained in *Choice* two months ago, promises to improve significantly the sound capabilities of compact cassettes, and we've just learnt that one manufacturer is already planning a Dolby S equipped cassette deck due for launch early next year. And DAT's on the way too (see *Update*). Things are really hotting up!

In addition to the reviews on 25 cassette decks, this month's *Choice* includes listening tests on 20 stereo headphones (at prices to suit all pockets), an interview with that outrageous radio broadcaster Victor Lewis Smith, and a look at how Sony has achieved such success in Europe with its hi-fi loudspeakers. And we've the second instalment of our feature on the rebuilding of a classic open-reel tape recorder, a Studer C37 which we rescued from a builder's skip earlier this year.

If you're having difficulty keeping up with what's happening in compact disc technology, don't miss next month's *Choice* which focuses its attentions on the latest CD players. Meanwhile, bearing in mind that the IBA is promising that its NICAM stereo television broadcasts will come on stream this autumn, we'll be explaining what's what in TV technology and testing ten stereo-capable TV sets.

Also with next month's *Choice* we're giving away the third in our series of free *100 Choice Cuts* supplements for record collectors. This time it highlights our all-time favourite classical recordings.

John Bamford

YOUR FREE MONEY-OFF VOUCHERS

This month we've another great deal for *Hi-Fi Choice* readers: a FREE book of exclusive money-off vouchers which can be used when purchasing any of the great products named on the vouchers. A Dealer Hotline Number is provided on each voucher and a quick telephone call will point you in the direction of your nearest authorised stockist for that product. Don't miss out on this opportunity to save £s on your hi-fi!



Cover photograph of the
Recommended
Revox B215-S
by Chris Richardson.

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Aspirations (top) looks at Revox equipment in bespoke cabinets/surroundings; Sessions hears the new Alexanders, seen in stormy pink (top right); it was going in a skip – rebuilding the analogue dream (above).

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News of the latest developments and products in the audio industry, plus the low-down from Chicago where analogue was buried at this year's Consumer Electronics Show.

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We visit a construction magnate who opted for a through-the-house system.

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A CLASSIC RECORDER

Richard Black guides us through part two of our saga – resurrecting a Studer studio tape recorder.



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VICTOR LEWIS SMITH

To the scourge of censors and delight of listeners Victor is back on Radio Four's Loose Ends. Dan Houston visits him in York.

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A comprehensive listing of all the currently available products we've reviewed, including prices, comments and value ratings.

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COMING UP

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BACK ISSUES

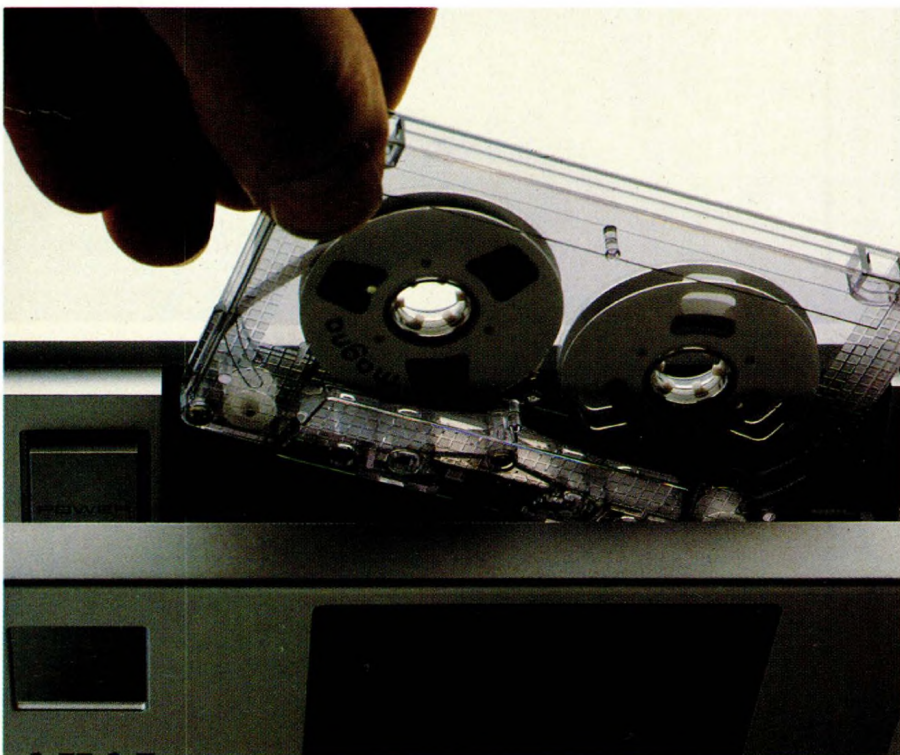
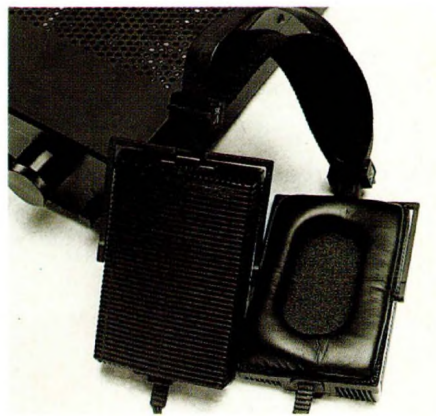
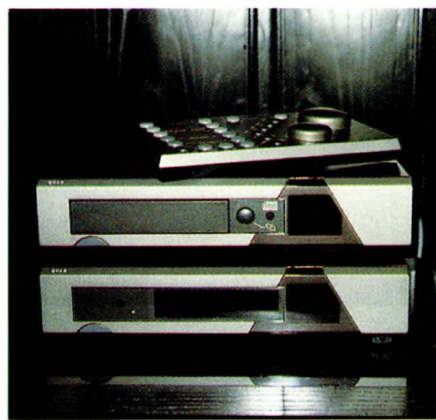
Newsagents cannot stock more than this month's issue of *Choice* but you can catch up on other equipment reviews using this page.

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PERSONAL MESSAGES

With turntable sales, especially Stateside, under pressure from the siege of CD, analogue companies are diversifying. PM listens to Rega's new loudspeaker.

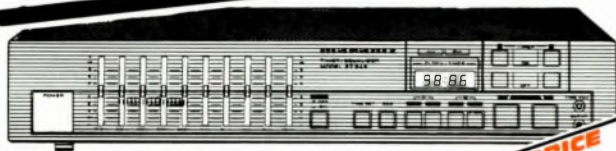
Going clockwise: Quad's up and coming CD player seen at Chicago CES, the most expensive of 20 headphones tested this month, Victor Lewis Smith trying to be decent during our interview, and cassette decks – testing 25 for our main review.



BARGAINS!

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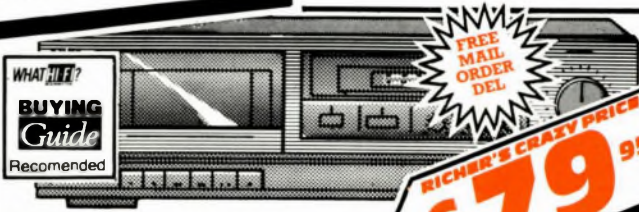
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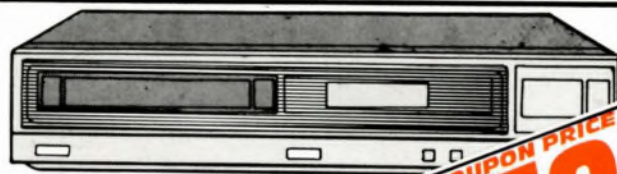
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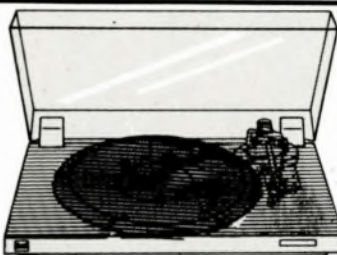
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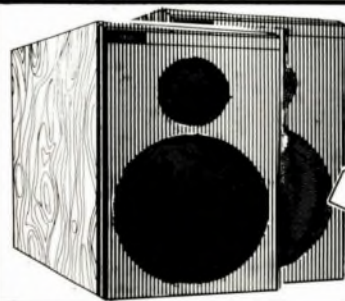
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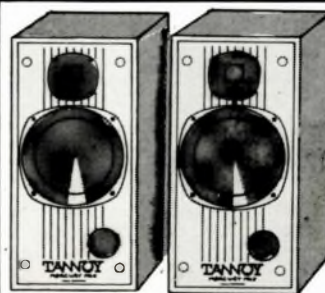
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Even the experts were genuinely impressed with the CD65IISE.

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This makes the CD50SE even more immune to vibration than its predecessor.

They upgraded the error correction decoder and improved the analogue circuitry.

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So why don't you ask your Marantz dealer for a demonstration of the CD50SE?



THE NEW CD 50SE
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PRODUCTS

TIMBER FOR TIMBRE

For the rosewood cabinet finish on its new £1,299 flagship model Monitor Audio invested £41,000 in a South American Santos tree. The 26-year old mature tree will provide the veneer for about 3000 cabinets of the *Reference 1800 Gold* according to Mo Iqbal – MA's managing director. And at a price like that the firm can wave a green flag as being a guardian of the rain forests otherwise being burnt for nothing!

However, the *1800* promises features to please the audiophile as well as the aesthete. The 'gold' dome tweeter – using an anodized aluminium and magnesium diaphragm – is positioned between the polymer bass and midrange drivers in an array offering close 'point-source' radiation at the height of the listener's ears. The bi-wirable floor-standing speaker contains a lower chamber which can be filled with sand or lead to improve stability and bass definition. The firm says its *1800* delivers a wide dynamic range with an especially accurate timbre for brass and percussion musical instruments, and has been built with long life in mind.

FEEDBACK-FREE INNOVATIONS INTEGRATED

Brighton based valve amp manufacturer Audio Innovations has broken new ground with its *Series 400* integrated amplifier which eschews negative feedback on sound quality grounds. The *Series 400* will retail for £575 and is equipped

with a total of seven glowing glass tubes, giving a Class A output of 12watts. It has inputs for four line level sources and an MM-only phono stage; Innovations step-up transformers can be used with low output moving coil cartridges.

The stylish casework design is also a new venture for the company, utilising a perforated mesh cover and special alloy extrusions which fit together in a solid and appealing fashion. The same basic case is being used for the new *Series 200* power amp, also a 12watt feedback-free design which replaces the old *Aria 12* and will sell for £350. A matching *Series 200* preamp is expected in the near future. Watch the *Choice Sessions* pages for more detailed reports on these amplifiers.

STREAMLINING FOR SOUND

Sound quality rather than flashing lights is the touted quest behind a new range of seven amplifiers from Harman Kardon. In a bid to provide 'the optimum combination of performance and facilities' HK says it has sacrificed some of the widget fanciers' buttons in favour of superior reproductive character. The amplifiers, priced in suitable stages from £159 to £849, are either newly styled and 'improved' versions of the existing range or new models – as in the case of *FM6800* and *PM6900*.

Also new from HK is a posse of four CD players priced between £199 and £369. All except the cheapest (*HD7300*) model are fully remote controllable while the two more expensive (*HD7500* and *HD7600*) feature new PWM



Top: Mister Speaker: Monitor Audio's new top of the range model. Above: Gotta lotta bottles: new styling from Audio Innovations. Left: Simple layout and rounded buttons make new HK CD players both user and duster friendly.



Above: Built to excel – the new XPL family from JBL. (That's enough 'L's – Ed.) Right: British styling plus oriental manufacturing equals a new Rotel turntable. Below: Riding a good idea: Philips CD transport in piggy-back clinch with digital amp.



bitstream D/A conversion circuitry which the firm prefers to Philips' PDM system. The amplifiers and CD players are available this month.

ART OF THE STATES

The American loudspeaker supremo JBL has produced a no-compromise range of transducers heralded as the result of 40 years of design and engineering. Four models with five different finishes are offered in the *XPL* range priced from £699 to £2,699.

The range uses a new JBL titanium midrange unit, and a refined version of an existing titanium tweeter. The bass driver is a composition using a polymer and Aquaplas coating over a fibre substrate. *XPL* cabinets are built of fibreboard and 'reaction moulded foam' with a neoprene skin for rigid, damped and non-diffraction qualities. Rear-ported with a rounded back and non-parallel sides, the cabinet design aims to break up internal standing waves.

All but the cheapest *XPL* speakers are bi-wireable and critical connections are gold-plated – wiring is 'professional grade' Monster Cable. The range

is offered in five finishes: standard black, walnut veneer, lacquered black, white or silver. The silver finish puts up the price of the top-of-the-range *XPL200* by £700 from the standard finish which costs £1,990.

WHEELWRIGHT JOINS BANDWAGON

Philips, co-inventor of the compact disc 'wheel' with Sony, has at last introduced a transport-only player. The £500 *CD D882* is based on the 'Recommended' *CD 880* machine which retails at the same price.

Earlier this year Kenwood produced the first commercially available CD transport, with the principle receiving audiophile acclaim. Advantages of a transport-only system are that it physically splits the two 'halves' of a CD player's job – thereby reducing interference between the mechanical and electronic elements.

Philips would ideally like purchasers to hook the *CD D882* on to the *DFA 888* digital amplifier (which performs the digital to analogue conversion process) but the transport can

also be used with other outboard D/A converters or DAC-equipped amplifiers. The 882 is a fully remote model designed to produce the purest possible signal with internal screening, isolation and a choice of either optical or gold-plated-coaxial digital outputs.

BE-RIBBONED

Watch out soon for a newly developed ribbon loudspeaker from British manufacturer SD Acoustics. The company has been quietly working on the project for over two years and the resulting £1,950 *SD Ribbon* will be appearing in shops during the next few weeks.

SD Ribbon employs two eight-inch bass drivers in a ported enclosure working up to 300Hz, with the crossover-less ribbon mechanically separated in a similar manner to that of Martin Logan's *Sequel* hybrid. Impedance is 4ohms, sensitivity respectably high at 87-88dB, and power handling is rated at 130watts. The design stands 150cm tall, 30cm wide and 25cm deep at its base.

Meanwhile SD Acoustics has moved down the road to a new

factory: Unit F179-183 Riverside Business Centre, Bendon Valley, Wandsworth, London SW18. Tel. (01) 874 7764.

MILEAGE IN VINYL

It's healthy to see a major manufacturer launching a turntable these days. Rotel has done it with the £180 belt-driven *RP855* which comes fitted with an Audio Technica *AT110E* cartridge. While the firm still sees life in analogue it has also launched its new Taiwan-made £250 CD player – *RCD855* – which fills the slot occupied by the *RCD820BX2* machine.

POWER TO THE HI-FI

Power supplies for all mains operated hi-fi components are being introduced by a new firm – Analogue Experience. First in the range of the products, which will bear the ANEX logo, is a turntable power supply to give the motor a 'clean' power source with electronic speed changing. ANEX, which is also developing a turntable, says the power supply is now available at 'around £100'. Further details: (0254) 676538.



TECHNOLOGY

DAT'S HERE

Digital audio tape machines have at last been given the go-ahead after an agreement between the record industry and manufacturers.

DAT, seen by many as the natural recording partner to compact disc, was invented five years ago but never released to the general consumer. Basically the hardware manufacturers (having once been scared by the Walt Disney versus Sony copyright battles in America

ALPHA GETS BETA

The natural progression of Arcam's *Alpha* range has gone ahead with the introduction of a budget CD player. The *Alpha* CD player is a four times oversampling model featuring twin 16-bit digital to analogue converters, and using Philips *CDM4* laser transport system. At £350 the CD player is styled to match the existing tuner, amplifier and Arcam *2-Plus* loudspeakers in the *Alpha* range, which totals up at under £1,000.



TECHNOLOGY PACKAGE TOUR POP

The Tussauds Group has launched its latest moving wax-works project featuring 50 stars of rock and pop music. The *Rock Circus*, in the converted London Pavilion building, Piccadilly Circus, gives visitors a guided tour through the last 40 years of popular music history culminating in a half-hour 'show', using a revolving theatre, where the dummies take advantage of the latest audio animatronics to jerkily mime their music.

Comment on the heady era is provided by a model of Tim Rice looking like a cuddly Thunderbird pilot as he steers the audience through 'performances' by the Beatles (*Sergeant Pepper*), David Bowie (*Major Tom*), Janis Joplin (herself), et al. Unfazed, the flesh version of the legendary songwriter was at the press launch to promote the Circus.

Prior to the 'show' visitors don infra-red headphones which relay CD sound of a song by the artist they are passing. It's all

reasonably lifelike with models wearing the clothes (some original) and adopting the poses by which history chooses to remember them, but to anyone over 25 the Circus will have a slightly static feel – like a black and white photograph – confirming that the musical movement of rebellion, thus frozen, has passed.

Sponsored by Fuji to the tune of £1m, *Rock Circus* is open from ten-til-ten every day except December 25th and costs £4.20 for adults and £3.15 for children.

SHAPE OF THINGS TO COME?

Having pioneered the use of liquid crystal display technology in television screens, Sharp Electronics has just launched (in Japan) a huge screen, projection and sound system which it heralds as the home entertainment system of the future. The projector *XV-100Z* will use TV, CD-Video or video cassette sources to produce a picture on screens from 25 to 100 inches wide. The projector uses three (primary colour) LCD lenses promising pin-sharp picture clarity which is better than that achievable with conventional technology, says Sharp. As well as the basic system the company is offering a range of equipment, such as adjustable screens, culminating in true 'home cinema' installations using amplifiers and loudspeakers to give five-channel Dolby Pro-Logic surround sound.

A spokesman for Sharp had no idea of the price of the system, but told *Choice* that it would be available here late next year.



Left: Baby Arcam CD player sitting still for photo opportunity. Above: Looking through the square window at TV's future – Sharp's claims are more than hot air. Below: Wax Aid: Tina Turner minus cellulite reminds of greatest musical charity.



when video recorders were introduced) were shy of litigation which could have proved disastrous if a precedent went against the home taping rights lobby.

At the end of July an agreement was reached by a joint working group, set up two years ago to resolve the copyright deadlock, stating that machines with a digital to digital copying facility could be sold to the public providing they allow only one copy of the source to be made.

This 'Serial Copy Management System' (SCMS) requires manufacturers to have a chip in their players which puts a

subcode on to the recorded tape. According to a spokesman for Sony the subcode will activate to switch off another DAT machine when a further copy is attempted. The idea is to make life difficult for bootlegging pirates who would use a string of DAT decks to make duplicate copies of a CD in real time. Confusingly, SCMS allows two copies of analogue sources – such as compact cassettes and LPs – to be recorded. Again one recording of a digital DBS (direct broadcast by satellite) signal is allowed while two copies of normal (analogue) broadcasts can be made.

SCMS is not a legal requirement at present but the parties agreed to recommend their proposals to governments worldwide in a bid to make the 'solo copy' concept a legislated global standard. Some sources expect the first machines to arrive by this Christmas but both Sony and Philips point to next autumn as a preferred launch date. "It's going to be very much up to the record companies to produce a software catalogue now," Sony's spokesman Paul Campbell told *Choice*. "With CD-Video we found a wide and varied catalogue is needed before the consumer is interested." Sony's

'you-need-passengers-before-you-build-a-train' comment applied even though DAT is seen largely as a recording medium.

Although the advent of DAT – which many commentators had been sceptically putting in the 'never happen' tray – is good news in terms of raising the public profile of digital (and therefore analogue) hi-fi, several offered caution about its availability to the mass market. Nick Thomas, for Philips, said: "Let's never kid ourselves that every kid on the street is going to have a DAT recorder in five years' time, the machines are mechanically more expensive than cassette decks ▶"



The Marantz competition line-up: a state-of-the-art giveaway.

BUSINESS

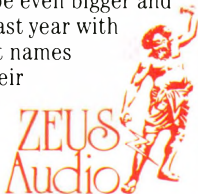
THE PRIZE IS RIGHT

Our £4,000 complete Marantz system prize, comprising *CD94/CD494* two-box CD player, *PM94* amplifier, *SD55* cassette deck, *ST54* tuner, *LD50 DMS* bi-wireable loudspeakers and . . . *CV55* CD-Video machine, has been won by J Jones of Wokingham, Berkshire. A second CD-V machine goes to the 'System' competition runner up – Kev Harvell, of Lymington, Hampshire.

As if that isn't enough, our third (June edition) Marantz *CD75/III* CD player goes to Mr Mark Callaghan of Clifton in Nottingham. Many thanks to all those who took part – we had over 2,000 entries – and commiserations to those who didn't 'win'.

GO TO THE SHOW

The Northern Ireland Hi-Fi Show, sponsored by our good selves and Zeus Audio, promises to be even bigger and better than last year with 41 of the best names exhibiting their latest products. Running over the



weekend November 3rd-5th at The Stormont in Belfast the show costs a nominal £1.50 entry (or £2.50 for all three days). The show is open from 2.00pm-8.00pm on Friday, 10.00am-6.00pm on Saturday and to 5.00pm on Sunday. See you there!

IN BRIEF

Trowbridge in Wiltshire has a new hi-fi shop – GP Smith Contract Hi-Fi which offers brands including Analogue Electronics, Denon, Dual, Mordaunt Short, NAD and Wharfedale.

James Kerr, the Glasgow dealer, is throwing a birthday party on September 21st to show off the new demonstration rooms and celebrate 32 years in business. Tickets: (041) 332 0988.

DNM amplification features at a Brentwood Music Centre musical afternoon and evening on Saturday September 23rd and Saturday October 28th. For details of venue and free tickets telephone: (0277) 221210.

The revamped and extended Cornflake Shop in London's Windmill Street also plans a DNM amplifiers musical evening on September 28th. Tickets: (01) 631 0472.

AND THE SHOW GOES ON . . .

America plays host to two massive Consumer Electronics Shows each year. Winter CES is held in Las Vegas in early January, Summer CES in Chicago in June.

Unlike anything we have in the UK, these shows (which are open only to trade visitors) really are mind boggling. Imagine something like London's *Olympia* exhibition hall, and multiply by ten; then you're close to comprehending the scale of these electronics jamborees. They take in all forms of 'home entertainment' and electronic office equipment, everything from legitimate high fidelity equipment to Mickey Mouse telephones and porno videos!

This year's Chicago show was America's 40th CES, and visitors needed to traverse the equivalent of 13 miles of aisles and over 17 football fields of exhibit space to see the 1,300-plus exhibits. And it was the CES where analogue finally died, reports editor Bamford with a lump in his throat . . .

Barely half a dozen record players were spotted throughout the show, and rumours that most major US record stores have been clearing their shelves of vinyl to

make way for more CDs proved to be entirely true, as British visitors to Chicago discovered when they made their obligatory pilgrimages down town to Rose Records to stock up on US software. Max Townshend was standing by his convictions, of course, exhibiting the new circa £2,000 *Rock Reference* turntable – and also announcing that Townshend International would soon be moving from leafy Walton-on-Thames to Houston, Texas! This means that a British distributor will soon have to be appointed for Townshend's products.

Meanwhile, a sure sign that the days of the record player are nearly over for all but a small handful of audiophiles who demand the best possible sound reproduction, was the announcement that Rega Research, which for over a decade has based its manufacturing business solely on affordable turntables and tonearms, is branching out to market loudspeakers and amplifiers. Rega's electronics aren't yet finalised, but the company was showing its new floorstanding *ELA* loudspeaker (£405). (See this month's *Personal Messages* column by Paul Messenger for more on the *ELA*).

Quad's imminent CD player, with matching model 66 preamp, both operated by infrared remote control.



and will never drop below the (£250) price level of a basic VCR." Thomas also envisaged record companies being reluctant to embrace the idea of DAT software – coming as it does on top of vinyl, musicassettes, compact discs and the host of variants such as the seven or twelve-inch single for which the music industry has to cater.

While DAT is slowly moving ahead, Dolby S – a recording process based on Dolby's professional SR (Spectral Recording) system – is planned for some conventional domestic cassette decks in the New Year. If Dolby S does what it is supposed to (*Choice* carried a full report in

the recent August issue) then we could be expecting the compact cassette medium to be delivering DAT levels of performance. Indeed just as Dolby SR has prolonged the life of analogue equipment in recording studios, Dolby S looks set to ensure the longevity of the compact cassette as an audiophile recording medium worldwide.

Unfortunately for most people, 80 per cent of whom buy cassette decks in the sub £200 price category, Dolby S will only be available on machines which meet stringent specifications (such as having user adjustable azimuth alignment, for example) and will therefore be beyond the

pocket of the normal punter. Denon is one of the first manufacturers to take advantage of Dolby S – with its £400 *DRM-1000* model expected in January (1990).

So Dolby S offers greater recording resolution for the analogue fold, and DAT looks like the future tape medium for serious digital music-lovers, yet CD-recording machines are also in the (more distant) offing. Sony has just teamed up with Taiyo Yuden (the manufacturers of That's tape) to produce a CD-R machine which will record the contents of one CD on to another blank disc. Importer Harman Audio was expecting the

machine before Christmas, but again for fear of record industry reprisals CD-R will only be available to 'professional users' at first. Paul Campbell (Sony) said that CD recording machines were envisaged as being useful for small CD pressing-runs such as promotional copies or syndicated 'star interviews' (used widely by North American radio stations) which are currently pressed onto vinyl.

The good news about CD-R is that the joint working group on DAT has agreed to get its collective finger out and resolve the royalties issue on CD-R at "an appropriate stage of development".

Staying British, Linn Products launched to the trade its new *Kaber* speaker and *Akito* tonearm (announced in last month's *Choice*), and was also showing a prototype of a 50watt integrated amplifier to be called the *Intek*. Price should be somewhere around the \$500 mark and it's scheduled for launch this autumn. Mordaunt-Short has a new *3-Series* range of speakers due this autumn, including a transmission line model designed by Robin Marshall, and Cambridge Audio was exhibiting its first new products since coming under the ownership of Hi-Fi Markets. Very stylish the Cambridge products look too, this revitalised company clearly anticipating much success with its new *CD3* compact disc player which UK enthusiasts will see for the first time at the Penta Hi-Fi Show in September, among a host of new Cambridge electronics.

As far as British companies doing well Stateside is concerned, no-one can match the phenomenal success of KEF Electronics. Thanks to a magnificent marketing effort in recent years KEF speakers are now 'going down a bundle' in the US, and at Chicago the company was showing its range to American hi-fi dealers in the quiet oasis of a hotel separated from the main hub of the show. We're already familiar with KEF's current *C-Series* loudspeakers of course, but what was of interest was the news that the company's Uni-Q technology is now being applied to some high quality in-car drive units.

Arguably the biggest news of the show, however, was the unveiling of the Quad CD player. After all this time Quad has finally got it together (well, almost – the player won't be available until later this year, and price is yet to be finalised),

Philips envisages that the CD-R machines will become available to non-professional consumers in 1991/2. The copyright argument is more clear cut with CD-R than with DAT or compact cassette where the consumer's complaint has been: 'why should I pay double royalties when I want to make a tape of my record for my car/Walkman/ghetto blaster?' Patently, CD-R users can only argue that they want to duplicate their collection for reasons of preservation, or might like to make a copy of a broadcast (digital or otherwise) – alternatively it's a case of just wanting to copy your mate's CD library.

though it's perhaps ironic that the company should be launching a 'conventional' 16-bit CD player just as Bitstream technology is threatening to make multi-bit players obsolete. Still, the proof of the pudding will be in the sound quality. Quad claims its player is "correctly engineered" (but of course), and the design is very distinctive – in the Quad tradition.

All functions are operated from the accompanying *66* remote control unit which is designed to reside on a coffee table, and along with the CD player Quad has a new model *66* preamplifier, destined to replace the *44*. Like the *44* it has Quad's usual 'tilt' and filter controls, but now they can be operated from your armchair, along with all the preamp's usual functions, by the same infra-red 'handset' that controls the CD player.

Other major talking points at Chicago were Mission's new flagship speaker, the 6ft tall *767* with actively driven twin bass drivers, and Magneplan's long awaited *MG-20R* which, when finalised (some time next year) is destined to replace the gigantic *Tympani Iva* four-panel Magneplanar at the top of the range. Much more practical than the *Tympani* system, which few homes can accommodate, *MG-20R* uses a new intensified magnet structure for the bass panels which provided more efficiency and diaphragm displacement. Bass response down to 20Hz should be possible in most rooms, and the demonstrations we were privy to were most impressive.

And Apogee was causing a stir with its new *Stage One* ribbon speaker, designed for audiophiles who don't have massive listening rooms. UK price will be £2,000-plus.

Other high-end audio highlights included a demonstration room cheekily entitled *The Sweet Spot*, a room shared by a group of companies (including Digital Music Products of DMP recordings fame) who had assembled an astonishing system including Mirror Image Audio amplifiers (not available here), the Wadia *DigiMaster 64* 18-bit digital processor and the gargantuan Duntech *2001 Sovereign* loudspeakers. Talk about moving air! And elsewhere Krell Digital was making good sounds driving Martin-Logan *Statements* with four Krell *Reference* amplifiers and new *KSB* preamp, along with the *MD-1* 'CD turntable' and *SBP-64X* digital processor. We're talking state of the art CD reproduction here, with state of



the art prices to match: approx \$4,800 for the transport, and £7,800 for the outboard DAC. There's a less expensive processor as well, the 16-bit *SBX-16X* at around £3,800.

So much for serious high fidelity, as there were plenty of glimpses of developments in more down-to-earth consumer land too. Philips was demonstrating CD-I (Compact Disc Interactive) which combines high quality sound, text, still image and full motion video, computer graphics and data on a five-inch disc. All information can be used simultaneously and interactively, and a number of leading publishers and entertainment



Above, Technics' vision of the Home Theatre; Left, a new flagship from Mission – the 6ft tall 767s.

companies are already preparing CD-I titles. That's right – the idea of having the entire Encyclopaedia Britannica on a couple of CDs is fast becoming a reality!

We were shown some real digital animation on CD-I (remember, on CD-Vs only the sound is digital, the pictures are analogue), and given a brief demonstration of the various sound quality options available. Due to the amount of information which has to be crammed on to the disc (data capacity is a staggering 650 Megabytes), new encoding techniques are employed so that the space requirement for sound can be reduced. Depending on requirements, sound quality can be 'CD digital audio', 'hi-fi', 'mid-fi' or 'speech'.

JB somehow managed to miss out on seeing Sony's 43-inch improved definition television (IDTV) which we're told will soon be available Stateside, but he did point his Box Brownie at Panasonic's *Home Theatre System* which was on display to show what's in store for us just around the corner...



Cambridge Audio makes a splash with the new *CD3* (above, left), while Krell's *MD-1* (left) is reserved for high-end hedonists. Above, Uni-Q technology makes it to KEF's in-car drive units.

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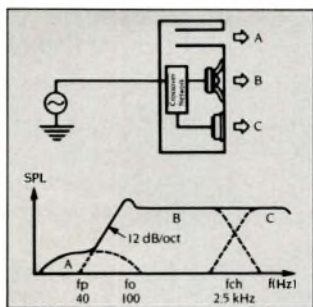
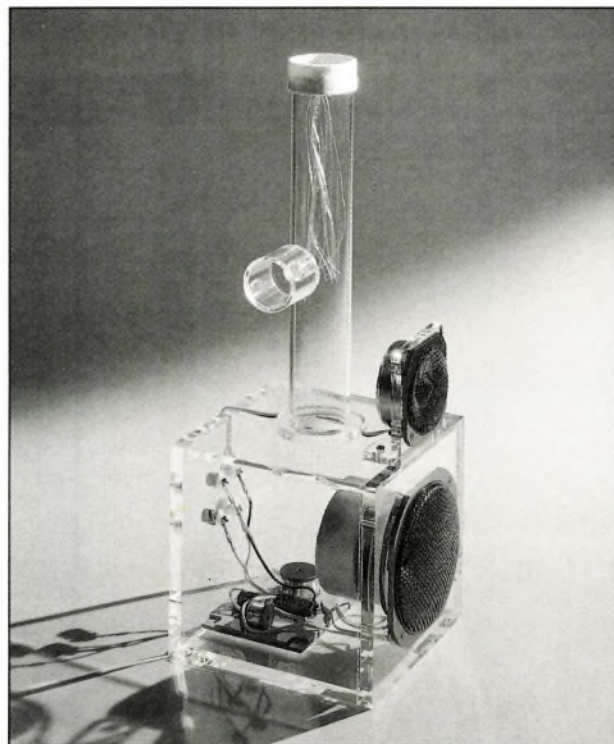
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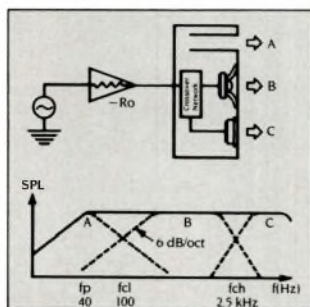
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CHOICE SESSIONS

Things we hear . . . This month, Meridian's digital loudspeakers, Dolby Pro-Logic from Lexicon, Sony's Video Walkman, a new speaker from Alexander, and a cheap 'n' cheerful phono preamplifier. Whew!

LOGIC CONTROL

Following the success of the CP-1 Dolby Pro-Logic decoder, Lexicon has now launched a cut-down version called CP-2. Andy Benham reports.

Ever since *Star Wars* made its screen debut people have been trying to recreate that sort of panoramic soundstage in the comfort of their own front rooms. The process started with hi-fi stereo video recorders, continued with Dolby Surround, and now looks to have achieved its goal with Dolby Pro-Logic.

At present there are only two players in the market – Yamaha and Lexicon – and it's interesting to note that both companies have a huge share of the professional sound effects market, delay units for concerts. Lexicon drew first blood with the release of the *CP-1*, although it cost the best part of £1,000. Yamaha was close behind with its *DSR-100*, at a mere £400, and undoubtedly it's this later unit that has led Lexicon to introduce the 'budget' Pro-Logic decoder, with *CP-2*. Mind you, at a shade under £700 it's still mighty pricey.

For those unfamiliar with the system a few words of explanation are in order. The *CP-2* creates its effects by decoding the additional information encoded on to Dolby Stereo video tapes. The Dolby Stereo system is a format which allows all those special cinema surround sound effects to be created. It does this by means of four separate sound channels – the conventional left and right stereo pair, a rear channel for the effects and a centre channel which carries the dialogue. In the cinema, the left, centre and right channels are fed to speakers behind the screen while the rear channel goes to speakers along the side or rear of the theatre.

These four channels are passed through a device known as a Dolby Stereo Matrix Encoder which produces the two channels that go out with the print. In suitably equipped cinemas, the process is reversed and the

four channels are recovered. The signals are encoded by the matrix letting both left and right channels go straight through. It then takes the centre channel and adds it to both the left and right signals, in phase, and adds the rear channel information with a 180 degree phase difference between the information added to the left and right signals. In 1982 Dolby Labs licensed a system known as Dolby Surround, which forms the basis of the vast majority of 'surround sound' systems. This system recreates the rear channel by looking at the phase difference between the left and right channels and feeding it to a rear set of speakers. Both the original out-of-phase components and the in-phase dialogue, however, are still carried by the left and right channels.

Dolby Pro-Logic takes the process a lot farther by not only recovering the centre channel, but also by removing the extra information from the left and right channels to restore them to their original signals. In addition, the decoding process seeks to maintain as much stereo separation as possible, a process known as steering. In theory, the result is a far wider sound stage, better quality reproduction, especially of music, and a far greater separation between the four channels.

As the majority of major films now come with a Dolby Stereo soundtrack, and as the extra information is transferred along with the soundtrack when the film is released on video, the range of source material is vast. As well as Dolby Pro-Logic, the *CP-2* also has mono logic and music logic, these being intended to give a 'surround sound effect' with non-Dolby stereo encoded source material. Like the Yamaha, the *CP-2* is an effects-only unit, ie it doesn't include any amplification, so in addition to your normal system power amp you will require two more – one to drive the rear speakers and one to drive the front channel. The unit does have provision for a 'phantom' centre speaker, but the system doesn't work anything like as well and if

you're going to spend serious money on a Pro-Logic decoder it seems silly to degrade the effects by skimping on a front channel.

Setting up the unit is simplicity itself. In calibration mode a 1kHz test tone is sent sequentially to each speaker. Using the volume pots on the rear panel you make the perceived volume from each speaker the same and you're ready to go.

Volume, left/right and forward/rear balance are controlled by means of an infrared remote control, as is access to the various user parameters such as rear delay. The obvious comparison to draw is with the Yamaha unit and I found the *CP-2* to be superior. In my experience the Yamaha *DSR-100* suffers from leakage of music and effects into the centre channel which tends to diminish the impact. The Lexicon keeps the front channel fully separate and also seems to be slightly better in removing unwanted signal from the left and right main channels. This was particularly noticeable in the first dog-fight sequence from *Top Gun*. Because all the effects and dialogue are so mixed up they present the unit with a real challenge, but the dialogue was nicely centred in the front channel leaving the jets to pass down the sides of my front room and from left to right across it.

Much of the improvement over the Yamaha can be attributed to Lexicon's automatic azimuth alignment system as the differences between the two units appeared to be greater on older cassettes and the Lexicon coped far better with slightly worn tapes, particularly my nearly worn out copy of *Top Gun*. Being an all-digital processor also helps when it comes to the more intricate signal processing. When choosing between the two units it should be remembered that the Yamaha is significantly cheaper, so it really is a case of you pays your money and you takes your choice.

Overall I rate the Lexicon extremely highly – it's a class above any Dolby Surround unit on the market, and although roughly

Add a third dimension to AV entertainment with the Lexicon CP-2 Pro-Logic processor.



twice as expensive as a good Dolby Surround unit, the extra separation and breadth of the soundstage make it a very useful investment for anybody who is serious about the sound of their films.

METAL MUSIC

Alexander has a new loudspeaker due to be launched this autumn. John Bamford listens to the prototype model.

The metal grilles of Alexander loudspeakers have become a familiar sight in hi-fi shops during the past couple of years. Alexander models have been regular visitors during *Hi-Fi Choice* loudspeaker listening tests too, the company's *Aurora* (£379), *566* (£159), and *514* (£139) models having been tested in issue Nos. 66, 71 and 74 respectively.

Next in the pipeline from Alexander is a \$249 model called *SE6*, which I'm told will be making its debut at this year's Heathrow Penta hi-fi show in September. Never ones to miss out on a bit of free pre-launch publicity, Alexander's distributors, Presence Audio, shipped a prototype pair of *SE6*s over to my house in late July, confident that, because Alexander speakers are much talked about at the moment, I wouldn't be able to resist writing a few lines about them. Of course, they were right...

In many ways the *SE6* is a typical Alexander speaker. Measuring just 27 x 14 x 17cm (h x w x d), it nonetheless has a very 'open-mouthed' and free-breathing quality and sounds dynamic and exciting even at moderate listening levels. There's none of that closed-in, 'sat upon' quality which one often experiences with such small enclosures.

This is the first time I've used an Alexander speaker at home; my experience of the company's other models is confined to *Choice* listening panel tests at Paul Messenger's house – and, of course, demonstrations at hi-fi shows. So comparisons are difficult. But I do get the feeling that this new *SE6* model has a more refined treble performance. In my system the *SE6* was a touch lean in the bass, however, it has been designed to work best positioned about four inches away from the back wall, and this is a set-up I am unable to accommodate in my listening room. With a little bass reinforcement from a back wall they should be fine.

A peek inside reveals that there's really nothing to these Alexander *SE6*s. The metal cabinet is left undamped, the small bass/mid driver is used 'wide open' with no crossover, the tweeter has the bare minimum of components to balance the sound output, and internal wiring is very thin solid core cable. Which only goes to show that simplicity clearly is the key to the Alexander success story. In material terms they seem very poor value for money compared to a £250 real-wood-veneered Monitor Audio loudspeaker, for example, but music enthusiasts are clearly enjoying the sounds they hear from Alexander loudspeakers – else they wouldn't be buying them!

The Alexander *SE6* is one to watch out for. Recommended amplifier power is 25-75watts (though I drove it with about five *real* watts from a triode valve amplifier, of course) and it's an easy 8ohm load. I'll be interested to see how they fare 'behind the curtain' in our next panel listening tests later this year.



FUTURE VIEWING?

Will commuters soon be gazing at miniature TV screens on their way to work? Alvin Gold views Sony's GV-8E portable TV video to give you the answer.

Pocket colour TV with liquid crystal glazing is now making inroads in a marketplace until now dominated by the Sony *Watchman* and the Sinclair *C5* (or Sinclair something...), neither of which were very practical nor very impressive. But I loved the idea. I've always been a sucker for small, high tech goodies of this kind, so when Sony launched its £800 LCD TV with built in video recorder in a package the size of a Filofax, I wasted little time in securing a review sample.

Being heavily into things small and high of tech, Sony naturally decided it couldn't let the opportunity pass by, and the *GV-8E* is the company's best opening shot at what a video *Walkman* should be. Probably it is mainly stitched together from existing components: the 8mm video mechanism from a camcorder maybe, an off the shelf LCD TV, the tuner and timer from somewhere else. There's a camera input too, so the Sony can be used as a monitor/recorder. Indeed overall interconnectability is good. In usual Sony style the *GV-8E* is supremely well built and finished, which is nothing less than you'd expect for the price.

The screen hinges up but the angle (which means screen polarisation) can be varied, and screen brightness and colour adjusted to give a clear, well saturated picture. But



Top: The Alexander SE6 – a capable metal box. Below: A new must for the Filofax crowd, Sony's pocket-sized GV-8E has an LCD screen and plays Video 8 cassettes.

resolution is limited more than with an equivalent CRT by the 88000/odd addressable screen elements, which is real beginner's stuff by TV standards, though good for an LCD.

There's only one tuner so you can't watch and record different channels, but there is a sleep timer and a 24-hour programme timer. It has a sweep tuner using the LCD as a tuning scale, and the latter can be switched off to save power if you're just listening. There's no surfeit of facilities, but the VCR has normal and half speed operation, the half speed providing a maximum of three hours on one cassette. You also get a range of basic accessories, including a 45-minute quick charge battery, a mains unit-changer, headphones (useful in view of the rather anaemic built-in loudspeaker) and a vinyl bag.

The Filofax presentation is one of the key features, of course. It's rather heavy at 1.2kg, but it's just as practical, having a small enough footprint not to swallow up too much valuable desk space, whilst being compact and tough enough to survive life in the briefcase. My kids found useful applications for the Sony playing video tapes during one long car trip. The only problem was the limited life available from a battery charge. Using the larger capacity camcorder type rechargeable cells (available at extra cost), you're supposed to be able to get about 90 minutes' use (TV plus video). I made it a fraction less than 45 minutes with the supplied battery pack, and when the battery-low sign came up on screen, there were only seconds to go. However, tuning and clock-timer data are protected independently.

The recorder section was marvellous. One benefit of a small screen is that the video gave screen results pretty well as good as off air – even at slow speed. The FM mono sound system also meant no appreciable losses, and no obvious speed instability either. Picture

quality itself was unreasonably good given the inherently limited resolution. One benefit of the large LCD dots are that they tend to crisp up the picture's appearance out of proportion to the detail presented. Most LCD TVs are rather deceiving in this respect.

Sony has already given the world personal stereo in the shape of the *Walkman*, a feat for which it has been suggested they deserve to be nuked, though I wouldn't go along with such drastic sentiments. I reckon the *Walkman* is a great asset to humanity and really enjoy the incessant squeaking and the inane glazed expressions on the faces of those addicted. Quite how a video version fits in with the *Walkman* culture is not easy to see. Can you imagine a busload of people all gazing intently at miniature TV screens? Would life be worth living? Before you say it can't happen, we all thought the same about the *Walkman* once. I'm here to warn all you earthmen that the unthinkable could happen again. Leaving its influence on mankind to one side, the *GV-8E* is a great product, but an expensive one and a little too power hungry for comfort or practicality. It's *almost* a mature and sensible product.

BUDGET MEASURES

John Bamford tries the Saturn, Analogue Electronics' outboard phono preamp for impoverished audiophiles.

Analogue Electronics, whose utilitarian looking amplifiers have proved to sound rather fine in blind listening tests in past *Choice* projects, sent us its phono preamp to try earlier in the year. Typically, it's taken me some months to get around to writing about it . . .

The idea behind the *Saturn*, which costs £62.50 including postage and packing, is that it should offer an affordable but worthwhile

upgrade to the phono stage of many a mass market amplifier, allowing you to get the best from your turntable without having to totally replace the amplifier – which, of course, would cost considerably more than £62.50.

Like all Analogue Electronics' gear, the *Saturn* is very simple (the company believes, like many others in audio design, that the simpler the circuit the better the sound), based on the phono stage used in its £130 *PRII* preamplifier but with a different equalisation system. The front end is an *LM833* op-amp which is followed by a single-ended Class A buffer stage. It takes a couple of PP3 batteries to power the unit up, and output is approximately 1volt peak.

A simple on/off rocker switch is provided on the front of the *Saturn*'s plastic box, and two pairs of nickel RCA phono sockets allow connection of your turntable and output, via an interconnect cable, to any line level on your amplifier. I tried it in place of the transformer and phono stage of an Audio Innovations *Series 1000* valve preamplifier (an extremely transparent sounding control unit costing the best part of £1,300) and was really very impressed by the *Saturn*'s capabilities. Focus and soundstaging were surprisingly 'high-end', the phono amp losing out only in its slight loss of bass extension and detail, and inferior portrayal of depth information.

Although there's nothing much to it, the sound quality of the *Saturn* is well worth the asking price – and it comes with a two-year guarantee. I would argue that if your record player isn't at least in the Rega/AR/Systemdek league then you should be saving up for a better turntable rather than worrying about the quality of your amplifier's phono stage, but if your deck's pretty good and you're stuck with an indifferent and ageing amplifier the *Saturn* could be just what you need. For further information Analogue Electronics can be contacted at: Hartley Farm, Upper Swainswick, Bath, Avon, BA1 8AF. Tel: (0225) 859473.

A FINE PAIR

John Seabury entertains Meridian's D600 Digital Loudspeakers.

Every now and then a product comes along which sounds so good and sums up the manufacturer's philosophy so well that you just *know* it's going to be an influential design. And in my opinion, Meridian's new *D600* digital loudspeaker falls into this category. It's a well-thought-out and innovative product which delivers a very high standard of sound quality indeed.

The price of £2,500 might make you wince – that is, until you add up the value of the electronics, or actually *hear* this metal-tweetered, three-way active enclosure with on-board Digital-to-Analogue converters. The building of DACs into a commercial speaker is in fact a world first for Meridian.

The *D600* has hi-tech convenience features, too. Tonal balance, channel balance and volume can be controlled remotely via the *609* handset (included in the price) and there's an LED display on the top of each speaker to show current settings. *D600*s can also communicate with each other, sending analogue and digital signals around multi-room or surround-sound set-ups. ♦ 21

A space age phono stage from Analogue Electronics.



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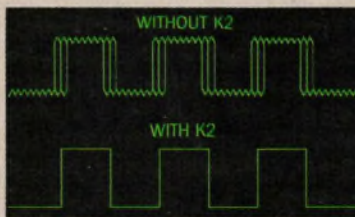
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Each *D600* sports a 25mm aluminium-dome tweeter and two 160mm polypropylene-coned drive units – one for bass, the other for upper-bass/midrange – and there's a rear-facing circular port.

The slim, but deep, cabinet is 90cm high with integral spiked feet, and is made of birch ply with a variety of fine, real-wood finishes available. Above the grille, behind a glass window, sit the LED display and infrared sensor.

The electronics themselves are mounted on an aluminium chassis at the speaker's rear. There's a 75watt power amplifier for each drive unit, plus generous power supplies, an active crossover, with 'tilt', 'bass' and 'Q' circuitry, and an electronic volume control. Then there's the digital circuitry.

As well as line-level analogue inputs, there are two co-axial digital inputs allowing you to send signal to the *D600* direct from the 'digital out' sockets of a CD player or DAT machine. The *D600* automatically locks on to the appropriate frequency. (An optical input is also included.)

Circuitry is 16-bit, 4-times oversampling, with passive filtering and one mono DAC in each speaker. You don't *have* to use a Meridian CD player, or one with 16-bit circuitry; any player with a digital output socket will work.

The idea is to carry out the signal-processing as near to the drive units as possible, and digital transmission should take cable properties out of the sonic equation (care may be needed over RF interference). The small amount of cabling used *within* each *D600*, is van den Hul stuff. And careful attention has been paid to grounding, too.

The 609 handset gives full remote control over the speakers' functions, and if you use Meridian ancillaries it will control the whole system.

In use, I found the *D600s* a delight. They gave of their best very willingly, with the sound-shaping controls helping to match speakers to room with a minimum of fuss. However, don't think you need a really large or special room for these speakers to 'open up' – you don't.

Meridian suggests a one-hour warm-up, after which you use the stand-by mode. (There's a non-volatile memory for the programmable settings, in case you *do* unplug!) There's also a temperature-sensing system to prevent overheating in use, and the electronics are internally fused. However, the *D600* can safely deliver a sound pressure level of 110dB so you'd have to be pretty aggressive to overdo things.

Note that while Meridian supplies the necessary digital leads, you have to provide your own analogue leads. All-in-all, there's quite a lot of cabling flying about, though it *can* all be hidden away . . .

I used the *D600s* with a Meridian 207 CD player (sending the signal digitally) and with vinyl, tuner and tape sources via the 207's preamp stage. Used conventionally, the *D600* sounded very fine, but with digital transmission there was that extra level of realism and detail. The *scale* of the sound, as well as the firmness, detail and stereo-staging were all most enjoyable; I heard something new on virtually every disc I played. From the natural warmth of double-basses to inner detail in hi-hat work, these speakers did a lot for the music without flattering it falsely. Nor did



the Meridian *D600s* ever sound forced in any way.

The top-end was more open and the sound more seamless than with previous Meridian speakers, except perhaps the (more expensive) *M100s*. On much source material the *D600* turned in a memorable performance. Simply recorded acoustic music came over with uncanny space and separation between instruments, and despite the wooden cabinets, the *D600s* suffered no plumminess on male voice or confusing mid-range 'grunge' at higher volumes.

On multi-tracked studio material the *D600* simply revealed what was on the disc. Older recordings like the Kinks' singles on CD or the Beatles' early albums came over as direct, energetic and fresh, even though you could pick holes in the recording quality. With modern multi-track material like the Eurythmics' *Savage*, the *D600s* gave a vivid and fast portrayal of the music with sturdy deep bass and a wealth of treble detail. The twists and turns in Annie Lennox' vocal delivery were preserved brilliantly.

So on subtle material the *D600* is subtle, on dynamic material it's dynamic. A clever trick! Only time will tell how significant the move to put DACs into speakers really is, but it's clear that all the elements in the *D600's* design come together very nicely. Even the display feature won me over. So I strongly recommend that you have a listen to the *D600* if you're anywhere near this sort of price-bracket . . .

Almost a digital loudspeaker, Meridian's D600 features on-board D-to-A converters.



ASPIRATIONS

Construction magnate Robert Stewart chose a Revox system to deliver music throughout his Buckinghamshire home. Dan Houston went to visit. Photographs by Chris Richardson.

"I think it's an outstanding piece of kit, it compares very well with the sound at a live concert," commented Robert Stewart, Chairman of the Kyle Stewart building firm. He was enthusing about his newly installed hi-fi system which relays sound through the living and reception rooms of his neo-Georgian house.

The red-brick house, designed by a local architect and built by Mr Stewart's own firm in 1974, is situated 600 feet above sea level in rural surroundings in the heart of Buckinghamshire about an hour's drive from London. Cracking over the pale gravel drive one is greeted by three labra-

dors guarding a kind of courtyard bordered by the back of the house and a row of tiled-roof garages. Double front-doors, and a porch on this 'back' side of the house, lead visitors into a dark and cool wooden-floored hall which opens again, through double doors, into a sunny drawing-room. On hot days, French windows in the south west-facing drawing-room are opened to allow a zephyr of air through the centre of the building.

The heat-reflecting stone-flagged terrace then leads the visitor outside to the front of the house across spacious lawns bordered by a healthy and varied muster of trees. A fish pond I learned, was sadly short of tenants due to a marauding heron. The atmosphere of gracious living is rounded off by an unobtrusive swimming pool and 'orangery' set apart from the main building. The house is inspired by the grander enterprises of the 18th century which is a favourite period of architecture for our host.

Three rooms make up the front of this house at ground floor level. On the west side a dining-room boasts a table that gives elbow space to 14, and a lounge in the east wing is a cosier alternative to the lavish central drawing-room.

All three rooms, and the television or family room next to the lounge, are comprehensively linked to the hi-fi which is discreetly housed in the drawing-room. Each room has its own loudspeakers and you can operate the system without having to leave your chair. Infra-red sensors placed on top of the loudspeakers in the lounge, dining and family rooms relay commands from a handset to the main system. The range of commands allows you to alter the volume-level, the source you are listening to (enabling changes from radio to compact disc, record or cassette tape, providing the software is in the machine), and also to skip tracks and search through discs and tapes, or through preset radio stations.

The system was installed by the specialist KJ Westone, and manager Paul Tam was present during our visit to explain the set-up. Everything but the loudspeakers and handsets is hidden for aesthetic reasons in a couple of reproduction mahogany cabinets made to KJ's specifications



Inspired by an earlier age, Robert Stewart has blended traditional style with modern convenience; the hi-fi is heard but barely seen.





Revox Resounds



by Bel Reproduction Furniture, of Great Yarmouth in Norfolk. There are two such cabinets costing some £900 each. One opens revealing drawers for cassette tapes and compact discs while the other contains the stack of Revox source and amplification equipment. This has a lid to make for easy use of the record deck, and which would also act as a perfectly good dust cover.

A record rack next to the cabinets holds Mr Stewart's favourite vinyl but he had the system installed because he wanted to change to compact disc and now listens mostly to digital or tape sources. "I originally started with the idea of just having a

the cabinets," he said, "they took about eight weeks to order." Apart from setting up the system and siting the loudspeakers correctly all the wiring between the rooms had to be hidden. KJ used Revox's own 42 strand (MR3) cable for the purpose.

The linear-tracking direct-drive Revox (B291) turntable replaced an existing Garrard record deck. It is a capable machine and offers all the hands-off, programmable appeal of a CD player. The CD player in this case is the (fairly new) B126 model which the Swiss firm labels as a budget player – though at nearly £650 it's still more expensive than most mid-range models on the market! The B125 cassette deck is used for the mostly pre-recorded cassettes in Mr Stewart's collection. It lacks a cassette-'drawer' as such and tapes are just slotted over the spools making for quick interchanging . . . with practice!

Everything is controlled by the Revox (B285) top of the range receiver which can power up to six pairs of loudspeakers if needs be. Only three pairs are powered by the receiver in this setting; the loudspeakers in the family room are 'active' – that is to say they have their own on-board amplifiers. The B285 receiver was designed with through-the-house systems in mind and there's no need for extra power amplifiers to run each set of loudspeakers. However, this means that when you turn the volume down in one room, it is turned down in all the rooms (except the family room). Tam explained that extra power amplifiers could be installed to overcome this if necessary.

Having a tuner incorporated into your amplifier is useful to overcome constraints of space. And if, like MCC member Mr Stewart, you are fond of cricket, something fairly capable is needed to convey Radio Three's long or medium wave coverage of the sport.

The main listening areas are the lounge and drawing-room where Audioplan loudspeakers fulfil the requisite demands of both function and form. It is to the lounge that Mr Stewart gravitates at the end of a busy day to listen to an opera or some orchestral music. The lounge has the smaller Audioplan *Kontrapunkt* speakers which are positioned in corners and practically hidden by a brace of wing armchairs. The room focuses on a large fireplace at one end, and is hung with oil paintings. Plants and a couple of bookcases create a relaxing atmosphere while the south and east facing windows make the most of English daylight. "Most of the rooms are light, and it is a joy to live in a light house," said our host.

Having the hi-fi linked to the TV room, next to the lounge, was almost an afterthought. But it means that all the ground-floor living areas of the house have music which is useful when the Stewarts are entertaining. Two shallow-box Revox *Piccolo* loudspeakers are placed on the floor next to the skirting board, fulfilling a basic



Central to the house the drawing room opens on four sides. Paul Tam (right) installed the system.



CD player," he explained, "but my existing (Dynatron) equipment was old, so I looked for a complete music system. It was just a question of how far I wanted to go from there. I'm not very technical and initially found this complicated to operate but now it's very easy. The quality of reproduction is magnificent – if you close your eyes the sound is all around you."

The choice of the equipment here though, was largely left to KJ Westone and Mr Stewart's trust in Paul Tam's expertise with such systems. After an initial visit to KJ in New Cavendish Street, London, "just to chat about what was wanted", Paul Tam installed the complete system in three visits. "The only hold up as such was with

function while also being unobtrusive.

Hidden behind the Bang and Olufsen (3747) television a Revox *Power Cube* sub-woofer gives the impression that the *Piccolos* have a frequency range belying their size. The infra-red sensor here is incorporated in the *Power Cube* and takes signals from one of the Revox (B206R) handsets in spite of being hidden from view, so you don't have to lean over the television with the remote control key pad. These handsets can be used with any of the sensors so you could carry one through these rooms changing the programme as you go.

The best loudspeakers in this setting are the elegant Audioplan *Kontrasts* in the drawing-room. Although they had to be placed a little too far apart for optimum imaging they certainly provide the sonic goods achievable with the Revox sources and don't get lost in such a large room. The *Kontrasts* were partly chosen for aesthetic reasons. KJ had to fulfil the brief that the hi-fi should not look out of place in the neo-Georgian house with period reproduction furniture. In this case the speakers' Pallasander finish practically matches the polished Steinway in the opposite corner.

Lastly, the dining-room uses a pair of Bose *301*s, again placed unobtrusively on the floor, and situated in diagonally opposite corners. The fairly small boxes actually provide a surprising level of bass although they're not set up for optimum sound reproduction; sitting at table listening to a piece of music engineered to show off the capabilities of stereo must be like a blind man sitting at a tennis match. Again the system is remotely controllable from table, and you could switch off a giddy-making record with one hand while reaching for a new bottle from the massive apple-shaped pewter wine cooler with the other.

Paul Tam told me a system such as this costs around £15,000. For your money you get a superbly sounding, reliably-built set-up that can be extended and upgraded to take advantage of new technology as it arrives, without having to install a completely new set-up. Many purist audiophiles would rather spend such money on just a record player, amplifier and loudspeakers, claiming quality rather than quantity as their quest. However, it's true that steps up in sound quality reduce with every leap forward in the size of cheques one writes and this system fulfils the demands of 'quality reproduction' in many listening areas. In any case the proof of this audio-repast is in the pudding and Mr Stewart is delighted with his investment.

Incidentally, Paul Tam has since left KJ Westone to start his own consultancy, providing both 'purist high-end' and multi-room installations from the London Listening Rooms.

System Installed by: KJ Westone, 26 New Cavendish Street, London W1. Tel: (01) 486 8262.



Specially-made cabinets open to reveal the hard and software; Audioplan Kontrasts (left) belie their name by blending in with the furniture.

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How can the Japanese enjoy drinking tea when it tastes uncomfortably bitter?

It's because the Japanese do not drink tea; they celebrate it.

They have an intricate ceremony, cha-no-yu, which ensures the tea is prepared in the purest possible manner. It allows them to appreciate the tea for its *natural* flavour, even if it is harshly bitter.

There is a parallel between this philosophy and the philosophy behind Aiwa's AD-F800 three-head cassette deck. For Aiwa believe that if a piece of music has harsh-sounding cymbals, then the cymbals should sound harsh on your recording.

If a piece of music features a thin-sounding violin, then the violin should sound equally thin on your recording.

And if a bass guitar sounds dry and unsatisfying, then your recording should leave you unsatisfied.

To help achieve this, the AD-F800 has been designed with PC-OCC circuitry for a purer signal transmission. It also has AMTS, a clamping system that reduces cassette vibration. And with three heads, the playback and recording functions are separated, which brings more clarity and precision to the music.

It is ironic: to achieve completely *natural* sound, you need perfect *technological* know-how.

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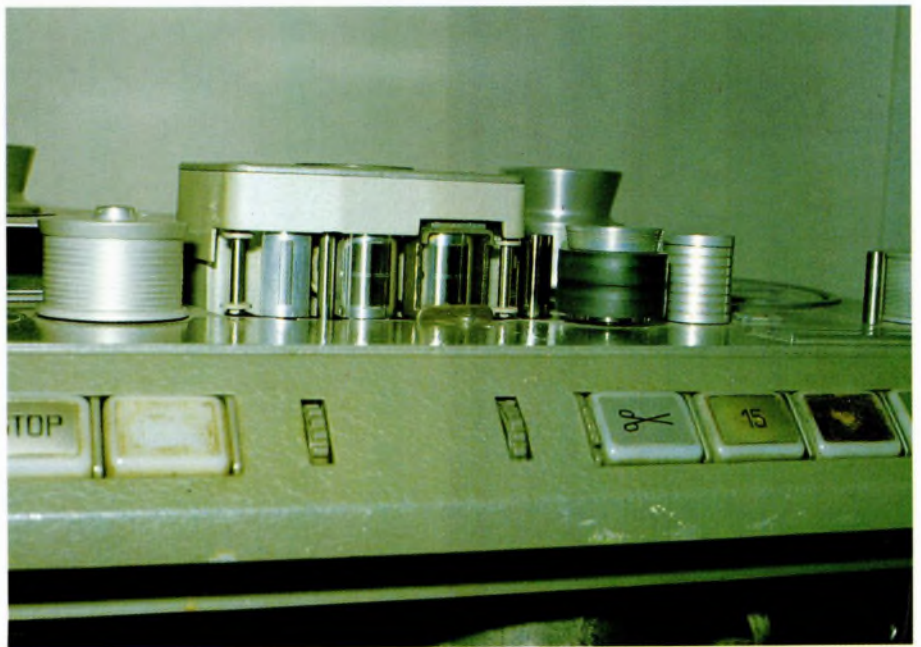
PERSPECTIVES

When he's not writing features for Hi-Fi Choice Richard Black can sometimes be found at the controls of a tape recorder, helping to make audiophile recordings for the independent label Altarus Records. Earlier this year we rescued an old Studer C37 from a builder's skip and asked Richard to catalogue the rebuilding and refurbishment work which would turn this workhorse recorder into an audiophile dream machine. This is part two of the project.

In the first of these two articles, in the August issue, we left our Studer C37 tape recorder restoration project half complete – a transport with half its electronics. Let's now follow the rebuilding to its end.

AUDIO ELECTRONICS AND HEADS

Given that the format on our C37 (stereo on a one-inch tape) is non-standard, the heads would clearly have to be custom made. Fortunately our Studer rebuilder Tim de Paravicini is an old hand at designing audio transformers, and they have much in common with tape heads. He specified the heads in great detail – thickness and material of the laminations, size and number of turns of wire in the windings, gap size and track width – and they were made to this specification by Branch and Appleby. In order to maximise bandwidth and minimise distortion it's necessary to juggle with electrical and mechanical



A classic recorder

characteristics of a head design, and not surprisingly the erase, record and replay heads demand very different specifications.

The heads, mounted on the transport part of the tape deck, are connected to the amplifier modules via short, high quality cables. In a modern machine the amplifiers would be plug-in printed circuit boards probably a few inches square, but the good old 1960's technology that is a C37 dictates a rather larger format; strong steel boxes some 8 x 5 x 1½ inches high, with screened valves poking out of one end and multi-way ribbon connectors to plug into the other modules. In fact all the electronics, except the valves and the variable components used for equalisation trimming, is on a PCB inside each case, and the generous amount of space used is a major factor in making the circuits so 'tweakable'.

In a genuine cost-and-inconvenience-no-object rebuild, the amplifiers would probably be scrapped and replaced out-

right. However, the basic circuits used are really very respectable sonically (as witness, for example, Decca records from the 1960s, almost all mastered on C37s and highly regarded by audiophile record collectors) and it makes sense to modify rather than replace them. This modification consists mostly of improvements to the bandwidth and phase response of the circuits, together with slight changes to accommodate the new heads.

There's also the question of equalisation. EQ (to use the abbreviation) is a filtering process applied to the signal on record and reversed on replay, the object being to adjust the spectral content of the signal to match the optimum characteristics of the tape. Thus when a tape is recorded the treble is boosted and when the tape is played back the treble is cut to give an overall flat frequency response. The amount of treble boost is defined by one of two standards, either IEC (Europe) or NAB (USA), appropriate to the tape speed in use.

These EQ curves are well established and give good results under a wide variety of conditions, but it's possible to improve on them if a tape recorder is to be used under a subset of possible conditions only. Since our C37 is to be employed for recording acoustic music it falls into this category. Basically, because acoustic music does not contain large amounts of energy at very high frequencies (unlike some synthesiser music), it's possible to use more treble boost so as to use the tape's signal handling capacity to a fuller extent. On replay, the treble is cut back rather more than usual and the result is a worthwhile, subjective and measurable improvement in signal/noise ratio.

Since the C37, in common with many professional recorders, was provided with switchable EQ, it is possible to retain the option of normal IEC EQ, which is what Tim did on our machine. However, even this had to be altered to cater for the new, higher, tape speeds used. So the choices are of IEC or 'Tdp' EQ, each at either 15 or

30 inches per second. The fact that the TdP EQ is not standard (it is currently available only on tape recorders modified by Tim) is of course not a problem; once a tape recorder is incompatible with every other machine in one respect, it might as well be incompatible all the way down the line.

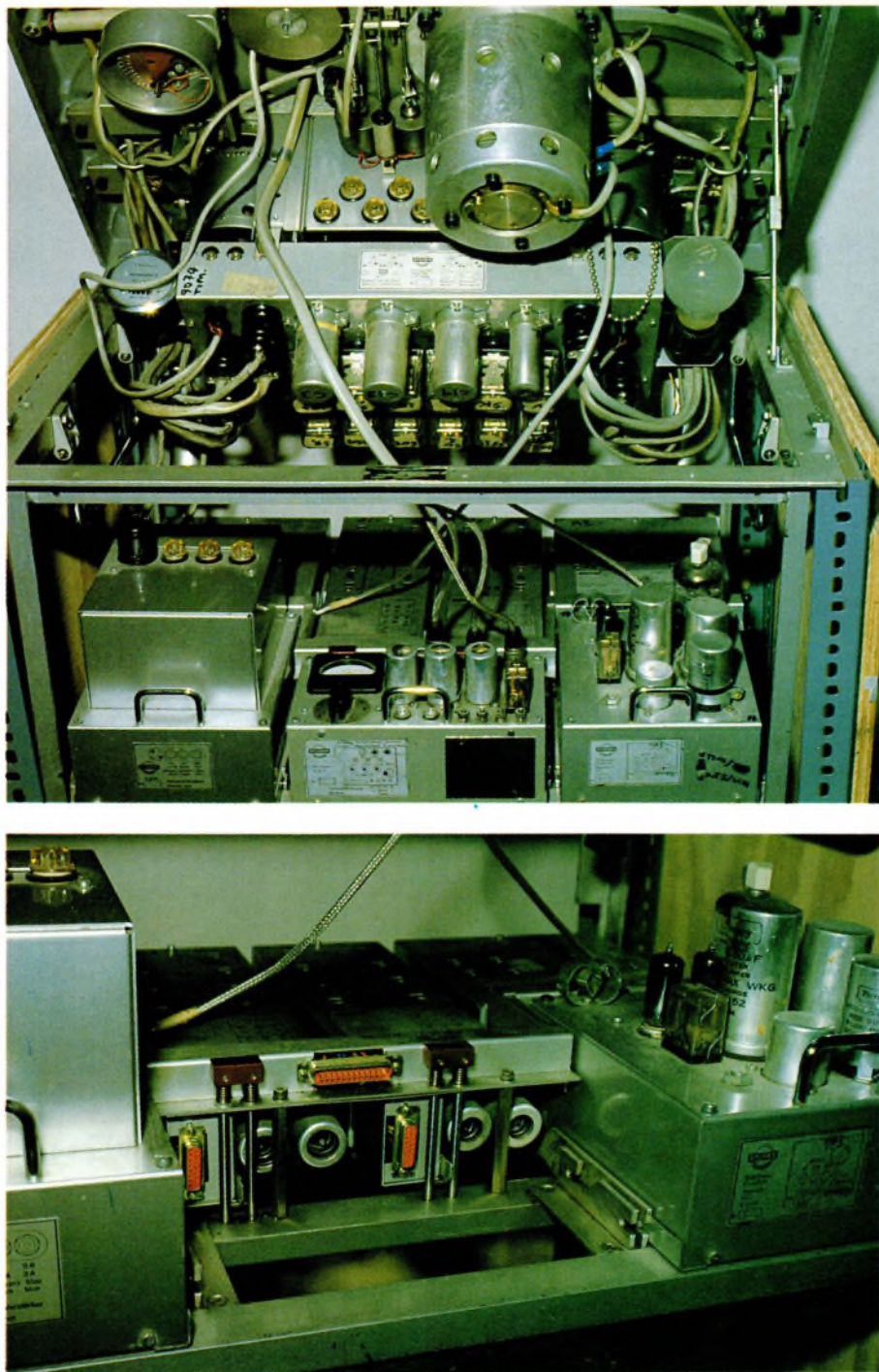
In common with many transducers, tape heads have a less than ideal frequency response – certainly less good than the associated electronics. This is a problem, but not an insuperable one; all that is needed is to electronically compensate for the imperfections in the head response. Of course, this job is easier if the heads are carefully designed in the first place, but given that criterion it is possible to maximise the useful range of a set of heads by suitable filtering.

This is probably the cleverest part of Tim's rebuilding. Although in principle it's not difficult to compensate for basic frequency response fluctuations, for critical audio work the response should be flat well beyond the audio range and should also have a linear phase response over at least most of the band. Implementation of correcting networks for such requirements is not easy, and inspection of the insides of the C37 audio amplifiers reveals numerous small capacitor and resistor combinations inserted at critical points in the circuit to cancel various head anomalies. The only limit on the amount of frequency correction that can be carried out is noise (if the signal is attenuated too much it starts to fade into noise and cannot be recovered), and Tim reckons that tape recorders can be made to record flat to 1Hz if only replay amplifiers could be made quiet enough to replay such frequencies at the correct level.

FINAL ASSEMBLY AND TESTING

The amplifiers and other electronic modules can be tested on the bench, and when they've been cleared individually the final job for Tim is to fit them together on the chassis and check the performance of the recorder, at the same time making suitable adjustments to EQ and bias settings. This is pretty straightforward as the C37 was designed (as any good piece of audio equipment should be) to be a working tool and easily adjusted.

First the heads are carefully aligned on the transport by eye and by measurement, with no tape loaded yet, to adjust zenith (forwards and backwards tilt) and azimuth (side-to-side tilt) to a reasonable approximation. Then the heads are demagnetised before a test tape is loaded – fortunately test tapes are available on one inch tape. Azimuth is set accurately, and replay EQ and level are set too. When the replay head is adjusted correctly, Tim locks the screw with a drop of lacquer and turns to the record head. Using a blank tape and a signal generator, the record head, bias level and record EQ are set to



give the same output at all frequencies as did the test tape. The erase head is adjusted to give maximum erasure of both channels.

When one considers that record and replay EQ, level and bias must be set for four combinations of EQ and speed it's obvious that a certain amount of work is involved. Important adjustments are checked every day at a recording session.

The C37 is now ready for use. At 15ips, using Tim's EQ, frequency response is within 3dB from 8Hz to 35kHz and within 10dB from 5Hz to about 40kHz. The dynamic range is some 80dB. At 30ips the treble response is better by a few kHz, but in fact the bass response is less extended and the signal/noise ratio is already so good at 15ips that this is how the machine will almost invariably be used. At typical record levels, say 10-20dB below maximum, dis-

Left: Gleaming new one-inch tape heads, made to specification by specialists Branch & Appleby. And top, Good old 1960's technology: generous space allows plenty of scope for tweaking the electronics. Tired ribbon connectors, above, have been replaced with high quality 'D' connectors – a real chore which demanded much patience!

tortion is around the 0.1 per cent mark (broadband – rising to 0.5 per cent at high levels), and wow and flutter are sufficiently low that measuring them accurately is not easy – 0.02 per cent is a conservative estimate.

GOING HOME

'Home' for this C37 will be Altarus Records, where it joins another such recorder in a similar state of tweakiness. When the first recorder was completed a couple of years ago, I helped carry out a few 'post tweak tweaks', experiments to see if we could take Tim's work any further. The results were interesting, and I include some of them here to illustrate what does and doesn't work in this context. Because of the exceptional resolution of such equipment, it's possible to do some very sensitive tests by modifying one replay channel and keeping the other unchanged, then recording a mono signal and comparing the channels with each other and with the input. Any changes shown to work were carried over to the other channel and, if appropriate, to the record section of the machine.

One change we made was to replace all the ribbon connectors, some of which were getting rather corroded and loose, with high quality 'D' connectors of similar numbers of contacts. This seemed like a good idea at the time, but is incredibly boring (there are three connector pairs with 24 contacts each, and four pairs with 14 contacts), and the D connectors can be difficult to mate. It is worth replacing tired connectors, but we will use the original type next time. We also tried a so-called 'contact enhancer' (on the old connectors), which made things audibly worse – woolly and indistinct.

Because various people have suggested that steel cases, being magnetic, might have an audible effect, we had an aluminium case made for one replay amplifier. I didn't expect any difference, but oddly the aluminium-cased channel sounded 'thin'

and squeezed. I don't know why, but my best guess is that the inferior magnetic screening of the aluminium allowed hum modulation to occur, maybe in the output transformer.

Naturally, we had to try replacing passive components with fancy ones although Tim had warned us that capacitor changes would make very little difference, which we didn't believe until we tried it. We couldn't decide whether there was a difference between various polyester, polycarbonate and polypropylene types, so settled for whatever happened to fit the circuit boards best.

Resistor changes (from professional carbon film and metal film to Holco precision metal film) were more worthwhile, and in the light of subsequent experiences I'm only sorry we didn't use higher power Holcos. Tim now uses something similar in critical positions.

On a slightly different tack, we figured that if quartz-referenced, low distortion power supplies improve record player performance they ought to work for tape recorders, at any rate those which use a synchronous motor. Accordingly I knocked together a 50Hz sinewave source and used this with a spare 500W amplifier to drive the capstan motor. The difference was blatant, and again I have to admit I can't really explain it fully – mains 50Hz doesn't seem all that bad, but something in it obviously upsets motors no end.

Finally, we changed a few bits of internal wire to Teflon-insulated stuff, which made no discernible differences – not surprising, given the minute lengths involved. As I write, we haven't had a chance to play with the insides of the new machine yet, but I'm sure we will find something to do.

KEEPING COMPANY

All this care and attention to a tape recorder would be wasted were it to be used with cheap and cheerful microphones, tape etc. In fact the equipment which will partner it for most applications is of simi-

larly high standard. Microphones have been Brüel and Kjær 4003 electrets for the last few years which were the best microphones I'd heard until a few weeks ago, when we used a pre-production pair of Tim's Esoteric Audio Research microphones. It is likely that the latter will be first choice in future.

Microphone amplifiers are EAR again, and cable is a standard computer cable which compares favourably with any of the special 'audio' cables I have come across. Tape is a tricky subject, but at present we use standard 3M 226. Metering is unusual; we use a custom-made fast peak hold meter which is calibrated at the session to read 100 per cent at a level within 2dB of overload. Recording level is set (with a screwdriver – no gain-riding here!) to use all the dynamic range available, the fast metering giving sure knowledge of any dangerous levels.

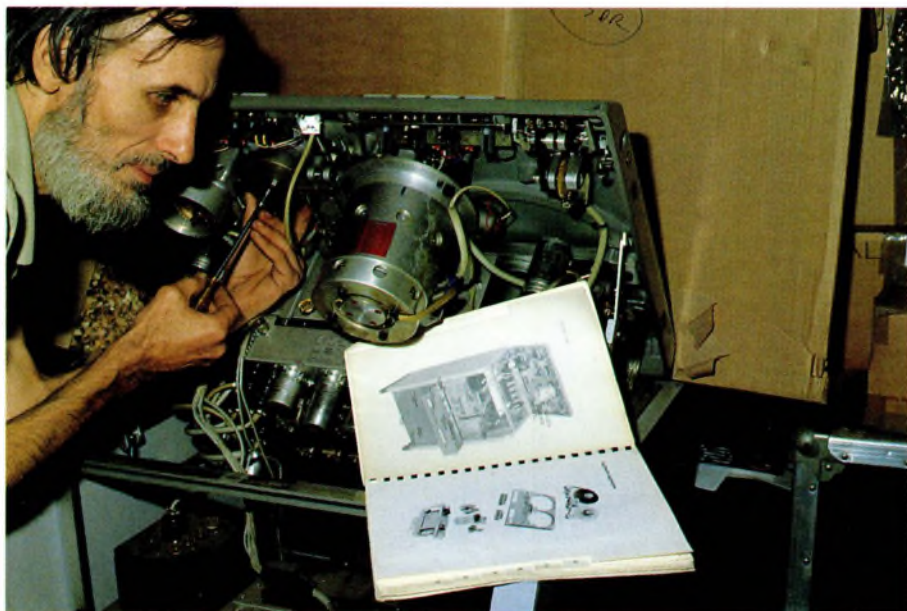
Requirements for monitoring speakers are similar to those for domestic hi-fi use (low distortion and coloration etc.) except for maximum output levels, which must be much higher. For one thing, monitoring is often done in quite large rooms and for another, it's necessary to listen at pretty high levels to spot 'noises off' such as London taxi brakes and mad dogs. Monitoring speakers vary from EAR columns to Stax *Sigma* headphones (when loudspeakers cannot be used). We have also used Townshend *Glastonburys* and very heavily modified B&W 801s.

IN ACTION

At this point, a confession – we haven't yet had a chance to use the new toy. However, since we have had considerable experience of a nearly identical recorder we know pretty much what results to expect. Having kept you in suspense this far regarding the outcome of all the work that has been put into our 'dream machine', it seems only fair to give you some idea of how it performs and how it's to be used.

Of the two original converted C37s owned by Altarus Records, the first to be completed and used was the half-inch version. This made its debut in March 1987, and as the one-inch recorder was finished by then we were able to test it out at the same time. We were already pretty familiar with current professional tape recorders, and it was obvious that the half-inch C37 had an edge over anything we'd used before. What was really surprising was how much better the one-inch machine turned out to be.

It is rather difficult describing sound reproduction which is a long way in advance of normal equipment. This is why so many reviews of 'high-end' gear practically glow in the dark. In general, it seems that the best equipment a listener has heard, however good or otherwise that equipment may be, always sounds practically indistinguishable from the real thing with no room for improvement. My hearing



is and always has been pretty good, but not many years ago I was quite sure that my cheap receiver-based system was as near perfect as one could wish for. Now that I am familiar with a lot of the best that current skill and technology can offer, most hi-fi sounds very obviously flawed. I like to think that in maybe five, maybe ten years what I currently regard as excellent gear will have been shown to be inadequate.

That said, working with really first-rate professional equipment – and that doesn't include most standard pro gear, which may be on a par with a decent budget hi-fi system but is often hardly better than that – is quite an eye-opener for sound quality.

With the *C37*, the immediate characteristic one hears is the solidity of sounds. The sound does not waver in pitch or dynamics, it is just *there*. In effect, there's clearly less artificial intervention between musicians and listener than one is accustomed to expect. This is not due to any one phenomenon, but to several; listening analytically, it's obvious that noise really is very low (in fact subjectively it is of similar order to a digital recorder), distortion is likewise low, bandwidth is extremely wide and very uniform, in phase as well as amplitude, and wow and flutter effects are certainly not directly audible.

So we were well pleased with the machine. Its first serious use was the one for which it was originally commissioned: a recording of the *Passacaglia on DSCH* for piano by Ronald Stevenson, played by the composer. As a suitable compliment to the wonderful music, the recording had to be beyond reproach and the converted *C37* was the ideal tape recorder. Ancillary equipment was as already described, and the Bösendorfer *Imperial* piano we used was specially prepared to Stevenson's specification by leading piano expert Peter Salisbury. (Tweaking is as beneficial to pianos as it is to hi-fi or fast cars!)

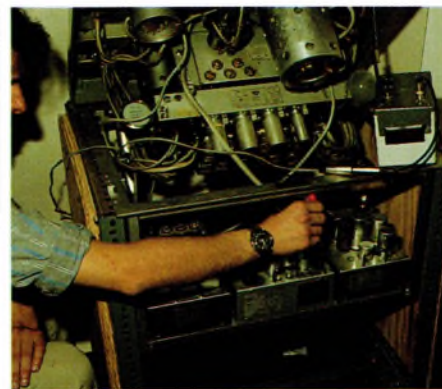
I mentioned in the first of these two articles that the desirable way to record acoustic music is with two microphones. This is essentially what was used on this occasion. However, merely pointing a pair of mics at a piano is not very clever, as positioning is critical. To get a result to his satisfaction, my friend Chris Rice spent several hours alternately moving the mics by a few millimetres relative to each other, or centimetres relative to the piano, then comparing the sound of it with reality.

Actually, the *Passacaglia* was recorded with four microphones. That is, two microphones were used for the basic sound, and two for special effects written into the score at various points. The extras were placed directly under the soundboard and inside the piano, and were used with a simple passive mixer to produce effects specified by the composer for recorded or broadcast performance (and achievable in live performance by use of loudspeakers). There is even an overdub in the recording, made at the cutting stage as the master

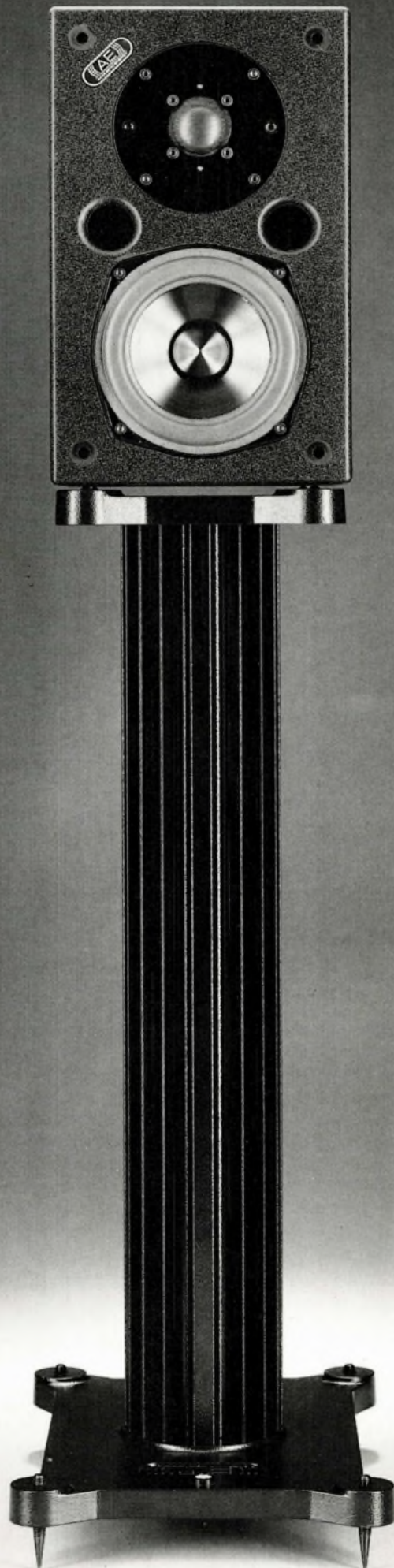


tape is edited without any tape copying to avoid degradation.

For a bit of fun, we had a small hi-fi/record business get-together one evening during the sessions. One point of considerable topical interest was the comparison between the *C37* and a digital recorder. Even the digital advocates present did not argue over the rather obvious superiority of the *C37* (ie, it was a lot more like the line feed from the microphones). The discussion was more over the respective merits of domestic media; is CD better than a typical cheap record player? Very probably, but I would ask another question: what does a typical cheap record player have to do with hi-fi anyway? (I mean the sort of thing that comes with many a rack system, not the serious entry-level hi-fi products.) Is the debate over CD/LP about real sound quality after all? CD may be here to stay (for the foreseeable future), but one thing is certain: improvements in audio quality are not finished yet! *Editor's note: Because of his close association with Altarus Records Richard was too modest to 'plug' the Ronald Stevenson piano recording which is discussed in this article. Interested readers can obtain Passacaglia on DSCH (Altarus AIR-2-9090 (2)) from good classical record shops. It's a 2LP set distributed by Harmonia Mundi.*



Fortunately test tapes are available in one-inch format (top). And above, important EQ adjustments can be checked easily while on location at recording sessions. Like any good piece of audio gear, the Studer C37 was designed to be a working tool and is easily adjusted (left).



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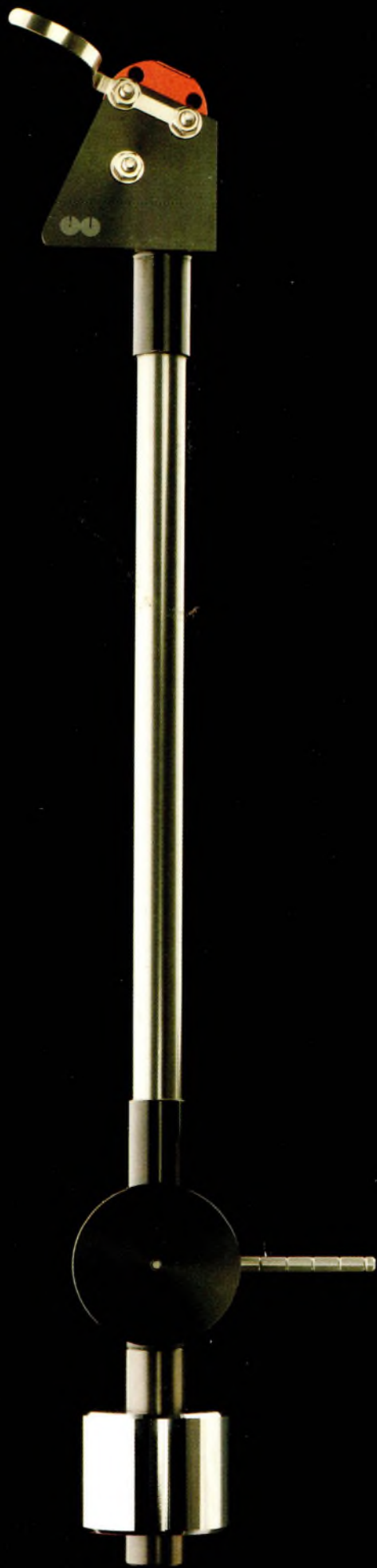
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Eric, with his roots in the blues and gospel, and Bert, who is influenced by folk and modern singer/songwriters, perform a selection of warm, inventive songs. A fulfilling sound is achieved with the use of just two acoustic guitars.

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This is another Opus 3 compilation disc, with musical extracts carefully chosen to illustrate what is meant by musical dynamics and comprehensive liner notes to show you what you should be listening for. How good is your hi-fi system?



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Jörgensen is one of Sweden's best jazz pianists, featured here in a traditional trio with bass and drums accompaniment. Most of the pieces on this disc are familiar tunes on which Jörgensen stamps his own colourful temperament.

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speakers themselves. It helps to have one of European consumer electronics' largest marketing budgets and sales teams behind you, with thousands of dealers already signed up and ready to go. But firms with similar resources have failed in the past, since all the marketing in the world cannot compensate for the wrong product.

Dr Bauer flew in one day to talk to *Choice* about the Sony loudspeaker operation. We'd met briefly several years before, and I had been very impressed by his frankness and openness about the difficulties of loudspeaker engineering.

Furthermore, I'd just finished reviewing two of the latest Sony ES speakers, with somewhat mixed results. So the opportunity to find out where loudspeakers, and Sony loudspeakers in particular, are currently at, and where they're going to be tomorrow, was a tempting proposition.

Dr Bauer is not a flamboyant character in the manner of some of the UK's speaker entrepreneurs, but beneath a mild exterior is all the self confidence of the West German engineering profession. His English is embarrassingly excellent, and he is also enough of a music and hi-fi nut to appreciate that our knowledge of acoustics and loudspeakers remains very limited in all sorts of ways.

Although the distribution and marketing clout of the Sony name plays a key role, the success of Sony Wega is due to a number of other factors, the most important of which is that it's not attempting to be a Japanese company at all. There are parallels with the strategy Sony adopted when moving into the broadcast technology market a decade or so ago, creating in Sony Broadcast a genuinely international company operating largely autonomously of its Tokyo parent.

Within the traditions of Japanese business practice, this was the sort of trick only a young 'maverick' like Sony would have tried to pull. But the results have been so outstandingly successful – SB has quickly dominated this important high tech market – that the mould-breaking was clearly well worthwhile.

The same pattern is unlikely to be followed in the Eurospeaker market, but the flexibility that autonomy brings is undoubtedly a crucial factor. Much of the difficulty Japanese companies have encountered in bringing their loudspeakers to Europe has been in attempting to transplant often expensive and elaborate technology. With increasing freedom as the policy proves successful, Sony is allowing Bauer to play the European market by European rules. Tokyo technology such as APM drivers is available, but not mandatory, leaving Bauer free to source components as and where he chooses: "in order to optimise the price/benefit ratio for the consumer", as he pragmatically put it.

Today's Complete Loudspeaker Engineer needs skills in three distinct

areas, each of which is equally important. Design is one essential of course, to give the end product a genuine individual identity, but component sourcing and QC testing skills are equally essential in the current commercial world. And the most important of these is sourcing – where the bits come from, and where they're put together.

Loudspeaker manufacturers do still manufacture loudspeakers, but the days of integrated factories press-forming the metalwork and diaphragms next door to driver assembly and cabinetwork is now becoming the exception rather than the rule. Established brands do tend to specialise in one area or another, and usually handle most of the production of more upmarket models themselves. But keeping price competitive at the 'budget' end of the market needs economies of scale which are often achieved through the use of OEM (original equipment manufacturer) suppliers.

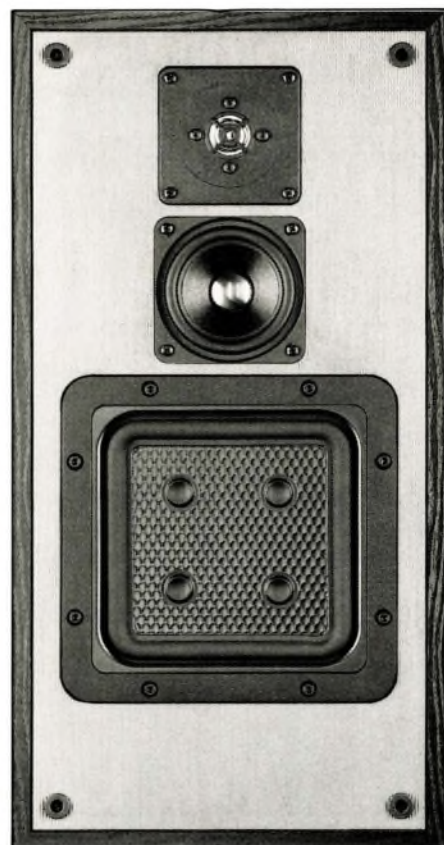
Thus, a hi-fi loudspeaker will (probably) be designed in a manufacturer/brand's laboratories, but may well make use of bought-in drive units, crossover network (components or assembled), cabinetwork and packaging. These may be gathered together at the manufacturer's base for final assembly, QC, warehousing and dispatch. Or the various bits can be collected, put together and packed at one of the main suppliers, usually the cabinet-maker.

Indeed the biggest UK loudspeaker manufacturers have little known names like Craftwise/Finewoods and Inghams. Their stock in trade is the production of cheap loudspeakers under a whole variety of brand names to partner many of the couple of million or so midi systems sold each year. Although the Danes have managed to get a toehold in the UK, in order to minimise shipping costs, cabinets still tend to be produced in the country of sale.

For manufacturers that don't build their own, much smaller components like drive units are sourced on a proportionately more international basis, overseas firms like SEAS (Denmark), Audax (France), Vifa (Spain) and Tonagen (Japan) competing fiercely with UK specialists like Elac.

Given the above structure, it's quite feasible for any brand to add loudspeakers to its line-up without any need to invest in a manufacturing plant, while a multinational gains further political and PR brownie points for adding local manufacturing content.

Indeed, several enthusiastic UK hi-fi marketing managers of big consumer electronics brands have taken the initiative to use UK OEM loudspeaker manufacturers to create specific models for the local market. Models like the Sanyo *Hi-Fi One* and Toshiba *S33s* have racked up a string of Best Buys in *Choice* over the years, which is evidence of how competitive such pro-



Top, Sony APM 181ES – the design is the result of extensive comparative listening. Below, Dr Hans Bauer – Sony is allowing him to play the European market by European rules.

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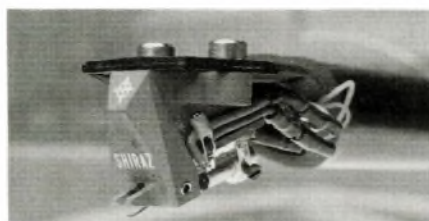


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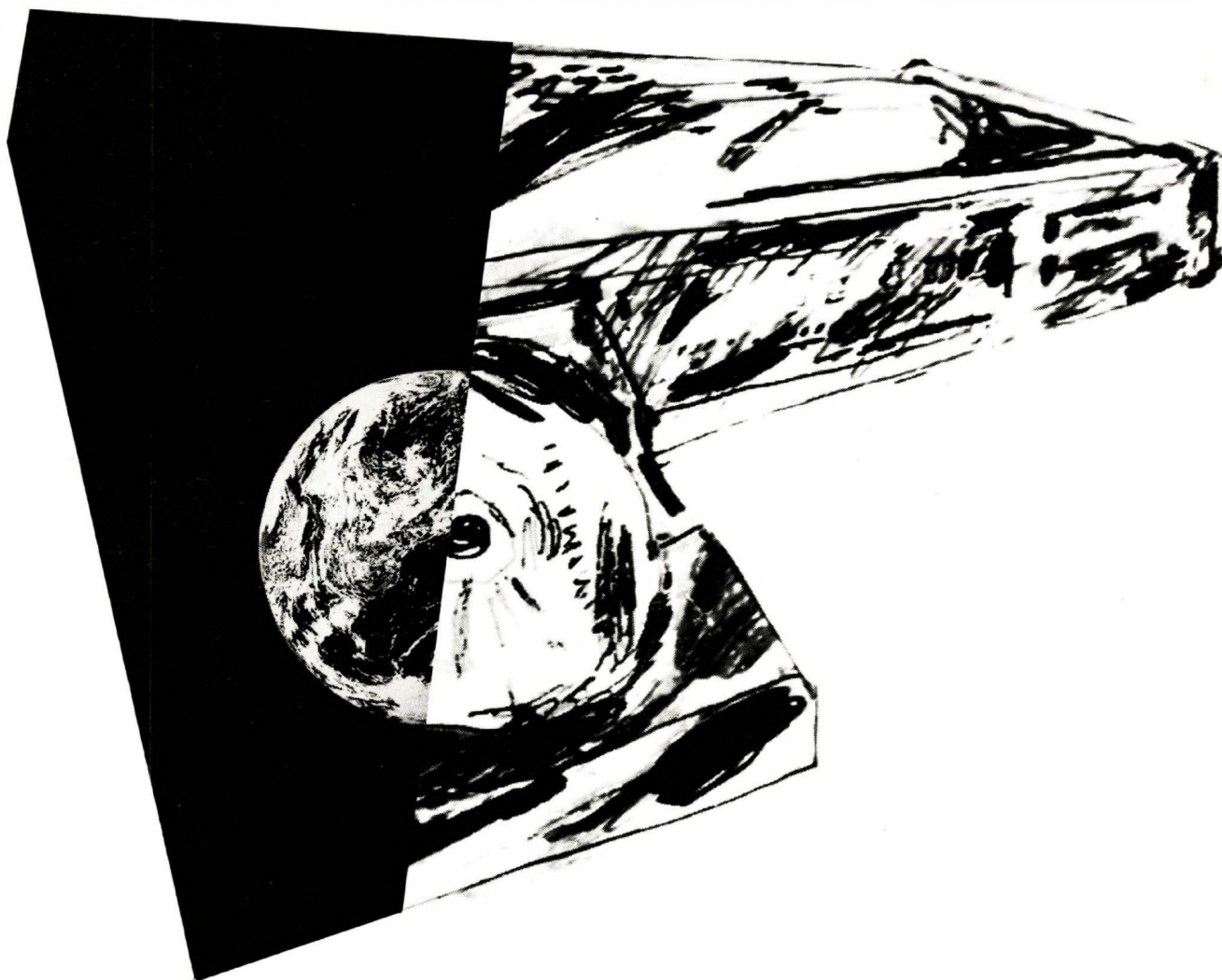
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FOCUS

Although specialist loudspeakers is the area where Japanese brands have been weakest in the UK, Sony is now probably Europe's largest brand. Paul Messenger examines how this has been achieved and talks to the engineer responsible, Dr Hans Bauer.

Enter any but the most upmarket hi-fi shops in the land, and the chances are you'll find a mixture of products which consist mainly of Japanese electronics and British loudspeakers. You'll also find UK and European electronics, Japanese loudspeakers, Taiwanese, Korean, Singaporean electronics, US 'high-end' and so on – all evidence of increasing industry globalisation – but the leading brands for

electronics will be Japanese, while the loudspeakers (and turntables) will probably come from mainly specialist UK companies.

That seems to be the natural order of things in today's marketplace, though it's certainly a source of irritation to some Japanese companies that the electronics takeover which they achieved in the early '70s remains incomplete at the loudspeaker end of the chain nearly 20 years later.

Of course, they haven't been idle during that time. First there were world video recorder and personal stereo markets to invent and dominate; more recently CD has kept the production lines busy, and taken much of the gilt off the turntable market to boot. But if you're used to sharing 10-20 per cent market shares with half a dozen other Japanese brands in virtually any market you tackle, it's a bit galling to find your loudspeakers left behind on the shelf.

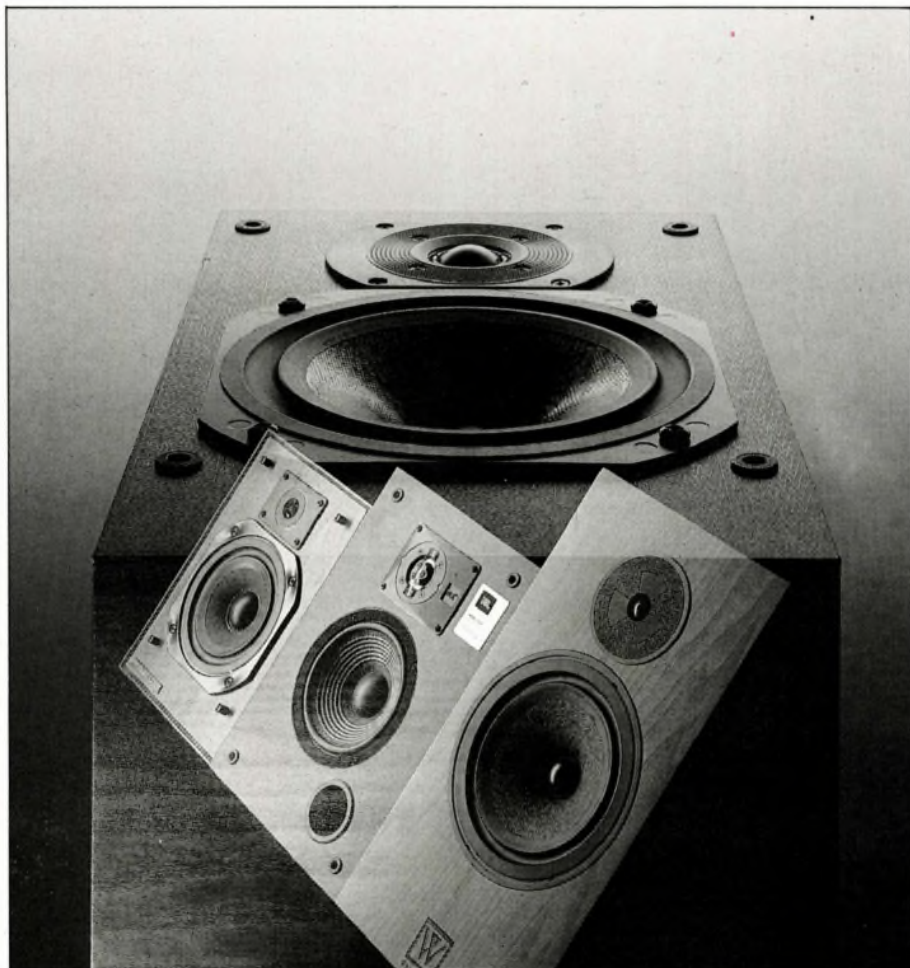
It's not that simple of course. If you lump all loudspeaker sales together and compare volumes, you'll probably find the Japanese brands coming out of it pretty well, along with Amstrad Fidelity, Alba, Philips and so on. But if you take the (midi/one-piece) music centres and packaged midi-systems-with-speakers out of the equation, the higher value hi-fi separates loudspeakers resolutely remain British in the UK; French in France; and German in Germany.

However, Sony has figured out that 5 per cent in each of these markets is worth 50 per cent more than 10 per cent in any one of them. So over a period of some years the company has created what is almost certainly the largest specialist hi-fi loudspeaker brand in Europe, albeit without any significant export interests outside Europe.

The man behind this gentle takeover – and hence arguably the most influential loudspeaker designer in Europe – is one Dr Ing Hans Bauer, the moving force behind a German company called Sony Wega in Strasbourg. Bauer came with the package when Sony bought out Wega some years ago, continuing to use it as a production facility for general consumer electronics, but creating within the campus a very successful loudspeaker specialist.

The success isn't entirely down to the

European rules



ducts can be, though both these brands are currently concentrating on midi systems rather than hi-fi separates.

The Sony situation has some similarities, but is also very different. The company's hi-fi separates operation seemed to lose direction and UK market share in the early '80s but has done very well out of CD, helped by its co-developer status with Philips. Sony has been especially strong in the midi separates system market, while the upmarket *ES* strategem is successfully re-establishing hi-fi separates credibility. The middle ground for budget separates is just starting to receive the Sony treatment, with an enormous 1989 line-up of new models, including the loudspeaker three- some which triggered this feature.

Sony Wega is a manufacturing plant, but concentrates on colour televisions, camcorders and so on. From a hi-fi loudspeaker point of view it provides the central laboratory for the design and specification of the complete range, though production is carried out in the various local markets. This not only looks good on the political balance sheet, it also allows subtle variations on the basic theme in order to suit different national tastes, which is an important part of the overall design process.

Bauer identifies the British and German 'sounds' as the two distinct major influences in Europe, attributing at least part of the reason why particular countries prefer either one or the other to the differences in the sounds of their languages. Scandinavia and even the normally chauvinistic French tend to favour the British sound, while the Italians are really confused, the North preferring a German balance, the South favouring the UK sound.

He regards the UK as the most important influence – the 'master sound' for Europe, mainly because of the world leading engineering of the major UK specialists. A lot of time and care is therefore spent fine-tuning any final design with Sony UK staff and outside consultants.

The recently introduced *APM-10IES* budget model differs from its predecessor in possessing a metal rather than plastic dome tweeter, which on paper at least is something of an achievement for a £100 loudspeaker. However, having been involved in reviewing both, I'm dubious that the change was sonically worthwhile, as the newer model is significantly 'brighter' in balance, with a rather 'exposed' treble compared to its predecessor. Wouldn't the extra money needed to pay for even a basic metal dome tweeter have been better spent on a slightly more sophisticated soft dome model?

Hans Bauer was honest enough to admit that engineering and marketing goals do not necessarily coincide, and that the decision to use a titanium tweeter could have as much to do with marketing requirements as the search for sound quality. Whilst pointing out that there are metal

domes and metal domes – that surface nitriding enhances upmarket versions, and that some gold-plated samples he tried sounded very nice indeed (but were much too expensive) – he noted that there were already signs of a move back to soft dome types in Germany.

Indeed, one weakness in the Sony operation must be that it's essentially marketing-led, and must therefore respond quickly to the latest loudspeaker design fashion. Bi-wired crossover networks, as planned for the imminent *APM-12IES* (the fourth new Euromodel) are a similar issue: "As a sales-oriented engineer, I understand that bi-wiring can help to sell the product; as an acoustical engineer, I feel it makes little sense, though star-earthing is vital in networks."

I also questioned the validity and cost effectiveness of the flat-diaphragm APM technology which Sony has pursued for a number of years, but which has now been replaced by more conventional cone units on the latest top models for the Japanese home market. Was APM just hype, and is it now yesterday's technology?

HB defended APM, but not in the way I'd expected, and his reply emphasises the irony inherent in the fashion trends that sweep through the loudspeaker market. He admits that APM does incur a cost penalty, especially if it's done properly, but claims it also offers some real advantages, particularly in manufacturing consistency. One problem is that it has taken a number of years to develop the system so that the positives outweigh the negatives.

During that time, cheap, poor quality cosmetic imitations on downmarket midi systems from all and sundry have tended to devalue APM's marketing advantages, just as its potentials were becoming capable of realisation. For example, the 'UK sound' requires a combination of high diaphragm stiffness along with high internal losses. APM's flat honeycomb sandwich is inherently very stiff, while the degree of internal damping may now be controlled by careful choice and use of adhesives.

Now that Sony is prepared to license specialist driver manufacturers to produce APM drivers, Sony Wega has decided to look for a European source, and Hans Bauer was full of praise for the Italian firm Faisal, as providing an ideal OEM supplier partnership. Fine engineering standards are combined with the 'zero defect' philosophy which HB reckons is vital to the future of loudspeaker production in Europe, especially at the budget end.

Pre- and post assembly testing, checking and (if necessary) rectification represents a significant chunk in the total cost of producing loudspeakers for the hi-fi market proper, yet can be all but eliminated by inculcating 'zero defect' attitudes throughout the European supplier infrastructure. Such a change would help improve competitiveness sufficiently to handle potential threats from outside



APM driver, seen here in the '22ES, offers advantages in manufacturing consistency.

Europe, for example from Malaysian operations re-exporting transplanted Japanese technology.

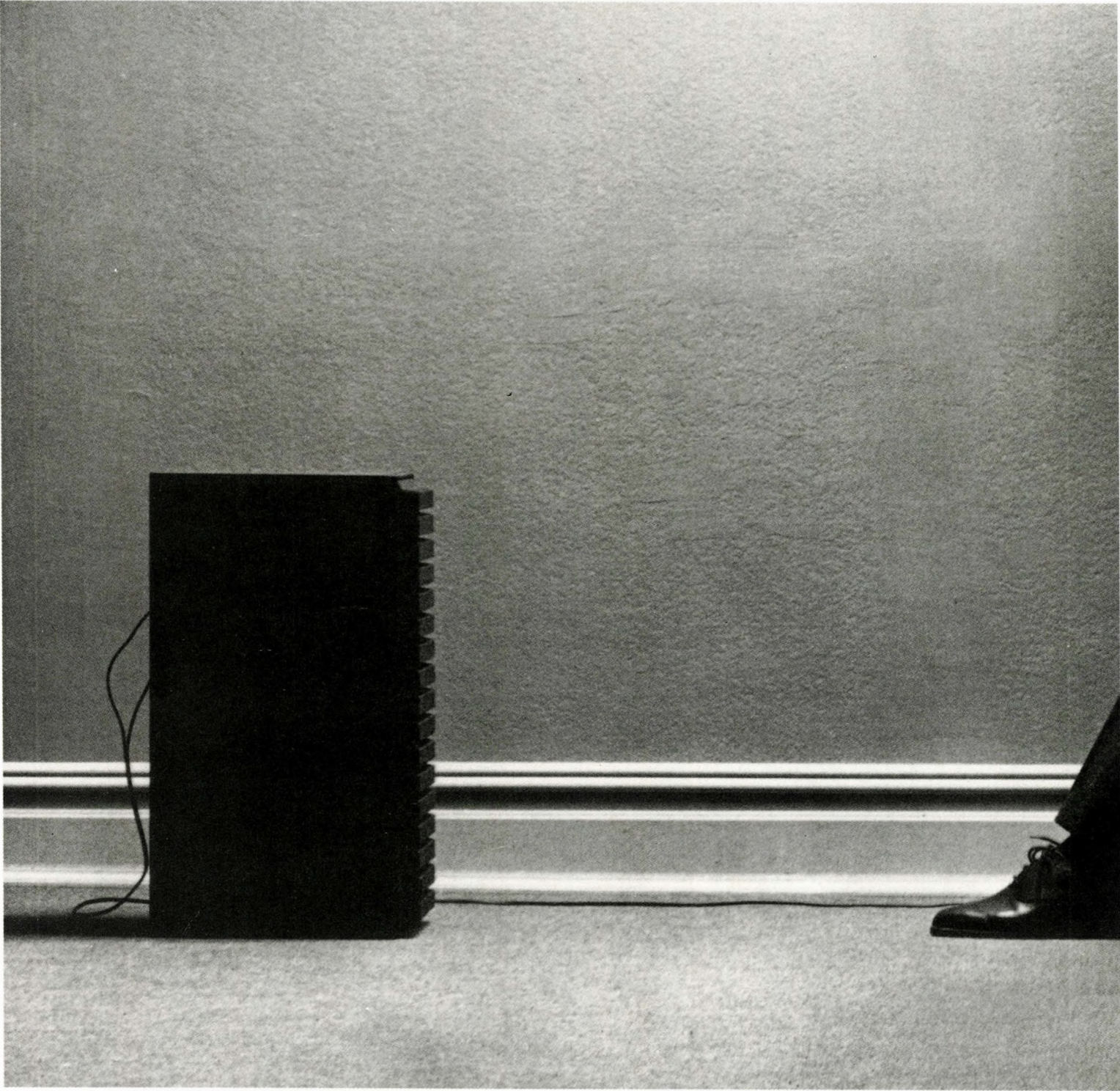
This perceptive understanding of commercial engineering realities, and his fundamental belief in the power of engineering disciplines do not hide the fact that Hans Bauer is also a hi-fi nut at heart, and shows a proper humility in accepting that our knowledge and understanding is very shallow and patchy – both prerequisites for genuinely successful hi-fi engineering.

Increasing availability of ever more sophisticated tools for analysis creates a strong temptation for the loudspeaker designer to stop listening to music and rely instead upon nice, repeatable objective measurements. However, this is a trap Bauer should manage to avoid; his recent designs all show evidence of painstaking human intervention before the design is finalised, from the damping panels added to the internal cabinet walls to the sand-filled sock in the *181*'s midrange tube.

No computer prompted the idea that a 2kg sandbag would provide effective mid-range energy termination, whilst also adding mass-loading for the tube and driver basket. It was the result of extensive comparative listening, and is the sort of creative, human-touch solution which one more normally associates with UK companies than multinationals. Moreover it's indicative of the sort of flexibility of mind which is needed to cope successfully with problems as complex as loudspeakers.

Sony may have a head office in Tokyo, but it shows much greater signs of operating as a genuine multinational than most other Japanese consumer electronics giants. In a very real sense, the Sony Wega loudspeaker operation is European through and through: alongside organising local sourcing, a vital part of Hans Bauer's role is to avoid having inappropriate (and expensive) Japanese technology foisted upon European tastes. And since the Sony loudspeaker range becomes more obviously European year by year, it's pretty clear that the policy must be working.

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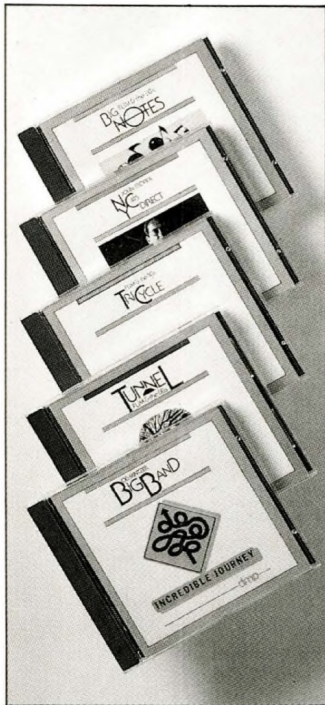


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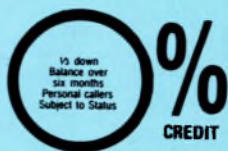
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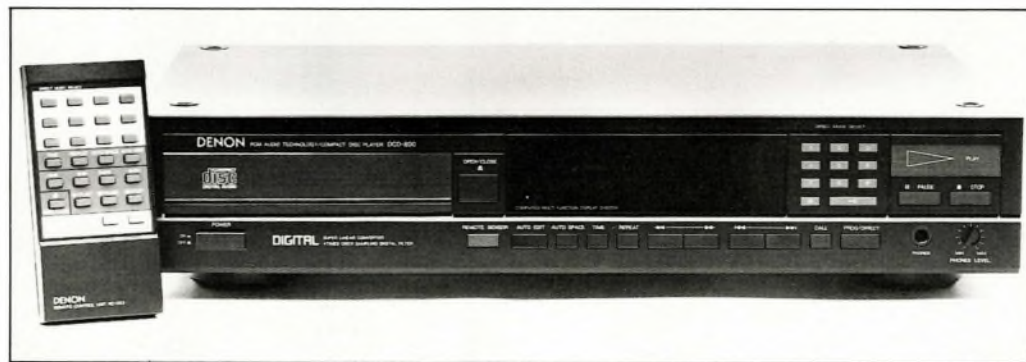
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15 inch Monitor Golds! Do you know how many Japanese audio maniacs are thumbing through the telephone book at this very moment desperate to find your number? Don't get rid of them. They are, as you know, something special.

What would really do them some justice and not break the bank is the new Audio Innovations Series 400 integrated valve amplifier, a real gem and in our opinion something of a steal at £575. It only pumps out 12watts, but those are real watts and the Tannoys are very efficient speakers. You won't be short on volume level.

In turn the 400 will need something worthwhile amplifying in its transparent manner and we would suggest that you try out the Systemdek IIX turntable with its own or a Rega tonearm and a Goldring G1020 or 40 cartridge. This combo is quite remarkable for the price and competes with players costing twice as much. Hook this lot up some good quality cable – such as Supra – and sit back. Don't worry if you never feel the urge to watch another video or listen to another cassette. This is



CD conundrums – see 'Strange Effects'.

quite natural!

But to answer the rest of the questions, your tuner and tape deck choices seem fine, a QED input expander would be a very good idea and no, Tannoy cannot replace Monitor Gold drivers. They are no longer built and consequently have become somewhat collectable – Tannoy estimates that they are worth in the region of £400.

NAD COMEBACK

In *Hi-Fi Choice* No. 73 August 1989, it states in the article 'Music on Wheels' that the 'Play Trim' function is a unique feature exclusive to Soundstream.

'Play Trim' is based on an idea proposed by me on behalf of NAD Electronics to Dolby Laboratories in early 1984. (Operating on the frequency response inside the Dolby processing loop necessitated approval by Dolby.) Dolby Labs was coincidentally working on the same idea at the time and proceeded to issue an engineering field bulletin to all licensees permitting use of the Play Trim circuits in Dolby B and C circuits.

The first cassette deck to introduce Play Trim was the NAD 6155 in 1984, tested by *Hi-Fi Choice* in issue No. 42, 1985.

B. E. EDVARDSEN,
NAD ELECTRONICS LTD.

Perhaps the word "unique" was a bit strong. What we should have said was that to the best of our knowledge the Soundstream player is the only in-car cassette unit to incorporate Play Trim.

STRANGE EFFECTS

Reading your Market Response article in the August issue I was interested to learn of problems users were experiencing with CD players that jumped or got stuck during play.

I have experienced this with my Denon DCD800. When recording from CDs the player was skipping or even repeating short passages. My dealer had not come across the phenomenon before and could offer no explanation, except possibly disc quality or laser alignment. As the fault was intermittent and discs giving trouble included Denon's own Digital Audio Check CD, these suggestions didn't seem likely. I decided to try re-siting the player, but due to lack of space the only change I could make was to move it from underneath the tuner to on top of it . . .

It worked! I can now enjoy hours of uninterrupted music.

Do you think that RF interference emanating from the tuner could have been the cause? And if so, should users be made more aware of this problem and be given better advice on the recommended siting of audio components?

PHILIP JAMES RIVERS,
MAIDENHEAD, BERKS.

How unusual. The only reasons we can think of for this effect are longshots, to say the least. It could just be the local oscillator or the mains tran: former in the tuner and their relative position to components in the CD player. But it's definitely a strange cause and effect. Perhaps moving the player relocated some element in the transport mechanism that had got dislodged when it was previously moved. Who knows?

IT'S A SMALL WORLD

I read with interest Richard Black's article on the restoration of a Studer C37 tape machine.

I used to engineer for Saga Records in 1979/80 (I now work in television). At this time they had a small basement studio in

Maresfield Gardens, Swiss Cottage. There was an appalling 12-track Scully, which was used mainly for re-mixing Jamaican reggae, and the C37 in question was the main twin-track mastering machine. It was always a pleasure to use. The accuracy of the cut from those dangerous scissors, combined with the superb mechanical counter, greatly reduced editing time – and with no razor blades!

During my time at Saga I made several 'audiophile' recordings together with producer, Martin Compton. In particular, one organ recording from Bath Abbey was recorded non-Dolby, and with only a valve AKG C24 stereo microphone. It still sounds superb – and not a digit in sight!

The performance of the C37 was always good (give or take a slight dip between 10 and 15kHz), and it is a credit to the original design that the record amps have sufficient headroom to modulate high performance modern tapes at four times the normal tape width.

It was a pleasure to see that the useful life of this fine machine is to be extended.

T. J. W. ROWDEN,
WINCHESTER.

Well, well . . . the C37 which Tim de Paravicini is rebuilding is doubtless the very same machine you were using ten years ago. Hope you enjoy part two of Richard's feature in this month's issue.

AS MUCH USE AS A FERRARI

I have just made the mistake of purchasing the July edition of *Hi-Fi Choice*. Falling for the sub heading under the magazine's title I made a logical assumption that a guide to buying hi-fi would

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Fi Choice

contain reviews and comparisons of hi-fi worth buying. Instead I find that the magazine is packed with reviews of equipment that is of much use to me as a Ferrari, that is to say unaffordable and completely impractical. It is not that I do not enjoy listening to music. In fact I try to listen to what laughingly passes as a stereo system in my front room as often as possible.

I just loved the comparisons, made by retailer Doug Brady, with the car market because, when cut down to the limit, a 2CV or a Rolls-Royce will still be able to get you to the shops or into work. A hi-fi system is merely for pleasure, and my dose of Thatcherism still has not managed to overcome the sense of unreality when it comes to paying large amounts of money for something that will not get a comparable proportion of use.

Finally, what happened to the free supplement? I picked up the magazine, complete in its plastic wrapping, but when released it was unaccompanied. Having paid my money I would like to see the contract fulfilled and request that you send me the missing item.

G M T COUPE,
LIVERPOOL

We're sorry that you feel so aggrieved about the contents of July's Choice. The Collection is our once-a-year look at 'high-end' audio – and although the lead mentioned on the front cover was 'Reviews on some of the finest hi-fi in the world', in your case this clearly wasn't enough to inform you of the magazine's contents. We would like to point out, however, that if you saw a car magazine which said "Tests on some of the finest cars in the world", you'd expect to find reports on Ferraris, Porphes, Rolls-Royces, etc – not Ford Escorts and Austin Maestros!

Although we would agree with you that a hi-fi system is "merely for pleasure", we can't quite make out why you seem so appalled that anyone should want to own the best equipment that money can buy. Sure a Citroen 2CV will get you to the shops, but a Rolls-Royce will take you there in air-conditioned comfort. If you want music in the home a table-top transistor radio can provide entertainment and much pleasure, but if you want

to try to create a 'believable' concert hall experience in your living room you'll aspire to owning the best sound reproduction equipment you can sensibly afford. Some people can afford better hi-fi gear than others. That's life.

(A copy of July's free 100 Choice Cuts rock supplement has been forwarded to Mr Coupe and the 'contract' duly 'fulfilled'.)

WHAT IS HI-FI?

Reading hi-fi magazines gives great pleasure. One gets news, information, but most important of all hopes to get correct data on equipment so that one can improve his (or her) system or buy a new one – to achieve 'High Fidelity'. Which is: "... giving faithful reproduction by the use of a wide range of sound waves." (Oxford dictionary.)

Looking back to Seventies' magazines in my small archives I see that the ideal *was* faithful reproduction. As we come towards present time, one discovers that one should expect 'musicality', and that 'accuracy' may be harmful to your enjoyment of music. Such comments are too common to count, but are typically interspersed among the articles of authors who at other times seem to convey sensible information to the reader. For instance: "... it is folly to make your system better in classic hi-fi respects if they result in you enjoying less music..." (JMH in *Hi-Fi Answers*, Feb '89). Then come long columns of lab tests and short comments on sound quality from *Hi-Fi News & Record Review*.

While one group is concentrating on measurements, the value of which I can not deny but think are insufficient to assess the performance of a product, others are trying to hear a teenage romance, mysticism, 'musicality' of their very own and transfer their satisfaction or disappointment on to the reader. This then becomes 'what the expert says'...

Do we all want different sound from systems when we spend our hard-earned money on them? Is it true that:

"... there are innumerable ways of doing this hi-fi thing..." (PT in *HFA*, Apr '88)? I would say not. There must be only one reality that everybody would like to reach given the chance, and that



How good is your imagination? Is a cheap 'n' cheerful musiccentre good enough to communicate the feeling of a live musical performance – or is something rather more elaborate (and expensive) required?



is the quality of sound produced at the time of performance at the place of performance. The correct reference is therefore the original performance. As this is not literally possible, the reference remains the master tape. So why don't we reproduce the signal as closely as possible to the master tape and leave the listener to decide whether he wants to tap his foot, yawn, or find out where the horn section is located?

Another misused word is 'illusion'. JK in *HFA*, Apr '89 says: "... hi-fi should be about creating an illusion that you have the full range without actually delivering it..." David Chesky, whose work I admiringly follow, also uses the word (*HFA*, Mar '89) although not quite to the same effect. To me, illusion is a confusing word that should be weeded out. Illusion: "... (the

seeing of) something that does not really exist, or of something as different from the reality, false idea or belief..." (Oxford Dictionary).

From a hi-fi system we perceive something: the soundwaves which originally emanated from a live source, are stored in some form, and given back as soundwaves – which exist. If all of them could be stored and all could be reproduced, you would have the perfect reproduction of *sound waves*. So where is the illusion? What a hi-fi system *tries* to do is reproduce an identical flow of soundwaves as the original. Any portable radio is more than enough to start you imagining the actual performance. There's nothing wrong with that either, if that's what you want...
N. JIHAN YILANLOWLU,
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However, when you ask people our country of origin, you'll get some very strange answers indeed. Some will tell you we're Japanese or Far Eastern, others will simply say they don't know. But few will give you an accurate answer.

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INTERVIEW

Victor Lewis Smith and co-writer Paul Sparks talk to Dan Houston about their work and the current state of radio. Photographs by Chris Richardson.



Victor Lewis Smith

On a recent visit to the UK Howard Stern, the radically rude New York DJ, said British radio sounded as if someone was standing behind the presenters with a gun to their heads. Stern, whose breakfast time comments on WXRK (92.3FM) often infuriate listeners, probably hadn't listened to Victor Lewis Smith on Radio Four's *Loose Ends*.

Over the past 18 months Victor has established himself as the dissenting voice of radio in Britain. Regular listeners to *Loose Ends* will be familiar with the 29-year-old satirist's "Up the line in York" slot which is co-written by 33-year-old Paul Sparks, a friend from early college days in London. The pair write five or ten minute pieces of quirky contemporary comment which are recorded by Victor using up to six tracks making a shifting base of manic monologue. His favourite accent is a pas-

"The only dangerous radio is one with the wires hanging from the back that you go to switch on after a bath."



tiche on the radio commentators of the '50s. The sketches vary from ranting diatribes by "a raving old dotard" clergyman, to thoughts about what might be a good job. Before the awful events in that first week of June Victor was musing the possibility of becoming Entertainments Officer in Tiananmen Square (Peking).

He says the only subject he doesn't get involved with is politics, but was once thrown off a Sunday morning programme on Radio York for referring to the Conservative conference Brighton Hotel bombing as "room service".

Recordings used to be made at the BBC but he now owns all the necessary equipment for working at home in York – the city he adopted after attending its university to read Music.

Like many musicians Victor regards hi-fi as a necessary evil; there's no reason to

reproduce music if you can produce it in the first place. "I don't actually know many musicians who own a stereo," he told me. And although he doesn't have a record player he's not very satisfied with the sound of CD either. "I think that classical stringed instruments on CD sound wrong," he says confirming the opinion of several other experts on this digital medium. The 'wireless' is preferred and he only has a limited collection of compact discs.

As well as writing music for television he has also written a couple of organ pieces for the York Minster commissioned by the Arts Council. Both he and Paul Sparks, who has just published his thesis on the Mandolin (or Persondolin as Victor would have it) prefer writing music to inventing sketches. "It's very hard work coming up with gags, especially when you're doing it all the time. When we first started it was

easy because we were just doing it for fun." And they believe that interest in the *Loose Ends* sketches will wane soon. "They're not that good," Victor says modestly, "really they're just cheap, one liners which are woven into a larger multi-layered thing." Nevertheless the investment in recording equipment belies such statements and in spite of the apparent lack of interest in the hardware one can be sure that it will continue to be used.

Until recently the equipment here was only the Sony (*XO-D1*) midi system with Sony *SSA1* not-so-loudspeakers. One of Victor's BBC friends, John Warburton, set up the other equipment with the primary purpose for making programmes rather than listening for pleasure. The tapes are put together using a couple of Ferrograph *SP7s* or a Revox *B77* model and a Seck (Model *122*) eight track mixer. BBC sound

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effects CDs are used on a Teac *PDI55* or Sony *CDP M205* CD player while a Teac *V-250* cassette deck is a better option than the midi's twin cassette deck. A Yamaha compressor (*GC2020B*) keeps the dynamic range of Victor's voice within the recording bandwidth and he can monitor the whole lot on a pair of JBL *Control Ones*. AKG microphones are used for recording the voices. The whole system takes up a corner of the room, and in spite of no soundproofing it is good enough to make recordings that can be used on air – stereo FM at that.

Ensnared in his second floor flat overlooking a quiet square and his parked 900cc BMW motorbike Victor now views his birthplace London "The Land of 01" with all the distaste of someone waking up from a bad dream. His parents still live in London. "Well you wouldn't call it living," he qualifies, "they can recognise light and sound, but it's a twilight world. Anyway it's chic to live in the provinces now, you can tell that to your readers."

Paul Sparks has also found provincial happiness but travels to York from Brighton three or four times a week to work. The pair enjoy a kind of Tweedledum and Tweedledee relationship, sparking (excuse the pun) off each other during our visit. It's a lucrative partnership. After publishing a book entitled *Buygones* they were asked to make a series of programmes under the same name for *Club X* on Channel Four Television.

Buygones are all the things you could waste your money on as a kid, such as Spangles, but which are now no longer available. "Buygone Number One," proclaims Victor in his three-decades-old BBC accent, "The Slinkeh . . . The Slinkeh," drawing out the word and slowing it down. Viewers are then subjected to his high speed explanation of just why this particular once-hyped toy had to go.

The duo have been involved in some advertising work too, writing the Midland Bank commercials for example. However, this has sadly resulted in less-than-regular contributions to *Loose Ends*. Advertising is preferred for income, "there's heartache and no money at the BBC, whereas in advertising there's bliss and loads of money," Victor explained. He defends the accusation that he may be selling out on an art form by saying "for a start what we do for *Loose Ends* isn't art whereas you could argue advertising is an art form. It's harder to write something which only lasts for 60 seconds and which has to be durable. It's more like music."

Now they are making a new programme for *Club X*. "It's going to be an irreverent look at the arts," explained Victor, "it'll be documentary style stuff using a camera hidden in a suitcase. For instance we'll take a draft copy of a 'book' which contains pages of pure smutty filth along to a publisher such as Mills & Boon and try to record their gut reaction." The programme was due to start on August 23rd.



Listening to *Loose Ends* I always imagined Victor to be physically like his voice: he sounds like a lean intellectual who is tall, dark and at least presentable. Our photographs provide sad evidence to the contrary and he makes use of his appearance with comments such as: "my girlfriend says I have a certain smoky attraction: the smokier the room the better." He describes his natural dreadlocks hairstyle as 'looking like a slashed sofa' and claims to have been approached several times by friendly Rastafarians who believe he has taken up their religion.

On entering Victor's flat one is handed a can of Dr Pepper (a fizzy drink hopefully soon to be a buygone itself) and slated with Victor's worst insult. "You're train spotters," he harangues, "all readers of Hi-Fi thingy magazine must be like train spotters I imagine." He is of course proved right when we admit that we 'just popped in' to the nearby Railway Museum.

The flat is . . . conventional. Home comforts and evidence of graceful living are absent. The living room serves as a work base and houses a desk supporting a computer, and the racks of equipment that are used to record sketches. There's no sofa and we sat on wooden chairs while Victor and Paul shared the piano stool. The rooms are littered with gadgets such as a huge lightswitch, itself a lamp from Think Big in New York or a Japanese plastic sunflower which holds a guitar and sways rhythmically to the sound of music. "The dancing flowereer," says Victor with a flourish.

New York is a place where Victor would love to work. Harking back to Stern's comment he said: "there don't seem to be any restrictions on radio in the States. We tuned in to him when we were over there and he was talking about whether the Pope masturbates or not, and if he did what he might think about. Now that's real radio." Paul joined in. "The thing is we've established ourselves on *Loose Ends* so we can get away with murder. But we've been



The duo at work (above) spotting train spotters. The equipment (below) is used as a tool rather than for musical reproduction.

asked to make several pilot programmes for other stations which get turned down although we haven't done anything different from what we are doing already. They say: 'we want something really dangerous for a late night spot' and then tell us 'we can't broadcast that!' when we give it to them."

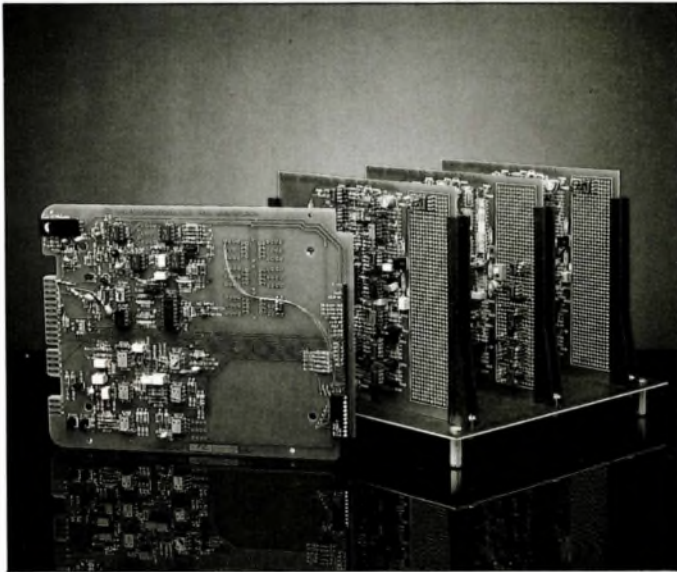
For Victor the only dangerous radio is one with the wires hanging from the back that you go to switch on having just stepped out of the bath. He was a producer for the BBC and consequently hates censorship since he once was responsible for programme content. Nevertheless their 'work' is sometimes edited or cut and the pair cite the BBC principle where one complaining letter is considered far more important than ten happy listeners as governing the attitude to radio practice in Britain.

By now Victor was sitting cross-legged on the floor playing his sitar which is sometimes used to give a zany oriental background flavour to sketches. "Baby sitars are cheaper, if you can get them, the problem is getting them," he answered when I tried to find out how much he'd paid for the instrument. He changed the subject: "You've not said anything about the hi-fi equipment but I suspect your silence denotes that it's cheap." Well Sony is reliable, I answered and left it at that. And, just for the record, I had no idea what kind of train it was that took us back to London.



MARKET RESPONSE

Dan Houston talks to the specialist marketplace, asking hi-fi dealers about current trends in cassette decks.



The most significant sail on the home-recording horizon at the moment is that of DAT (Digital Audio Tape) which has been drifting in the political doldrums for two years while hi-fi manufacturers and the record industry argued over the threat it posed to copyright.

At the end of July, as we were putting this issue of *Choice* together, an agreement was reached by a joint working group set up to resolve the copyright deadlock, stating that machines with a digital-to-digital copying facility *could* be sold to the public providing they allow only one copy of the source to be made.

As if this isn't exciting enough, another development on the horizon is Dolby S (see this month's *Update* for more on this). Dolby S could significantly improve the performance of upmarket cassette decks in the near future; indeed, Denon tells us it is already planning a new model, due early next year, incorporating Dolby S circuitry.

Early (breadboard) Dolby S electronics, above, will be condensed into a chip or two. (Below) DAT for you and me, whoopee!



But through all these gorgeous and noteworthy developments little comes to light that will affect the average cassette deck buyer. It seems most of us (77.9 per cent according to AGB figures) buy decks in the sub £200 bracket, where the pursuit of excellent sound quality is less important than user-friendliness, reliability and features-per-pound (sterling).

Cassette decks are rightly known as hi-fi's bastard medium and regarded as something of a necessary evil to the hi-fi fraternity. Most of the dealers we spoke to for this survey commented that they sold cassette decks as an add-on piece of equipment in its own right. In terms of sound quality the cassette deck is certainly regarded as inferior to CD or vinyl replay equipment although the sales of pre-recorded software, at 80.9m units a year, show that the public majority couldn't care less. (Vinyl sales stand at just over 50m and CDs are approaching 30m – 1988

record industry figures.)

However, the software sales do not translate to sales of separate cassette decks, so most of this pre-recorded software is probably bought by audio rather than hi-fi users. Cassette deck sales are currently around 175,000 units per year reflecting a market worth just over £31m. Recent 1989 figures from the AGB (Audits of Great Britain) group show the market rising at the rate of nearly 15 per cent from the same period last year. Corresponding figures put CD player sales at over half a million units while record players tag along at 160,000 though their market value is higher than cassette decks at some £40m.

To compile this market survey we sent out questionnaires to dealers up and down the country asking them which are their best selling models and which brands are reliable. Subsequent telephone polling then puts some flesh on the bones of the results and the survey is compiled much as an opinion poll – which is how it should be seen. We don't pretend our list of best sellers is 100 per cent accurate for the free world right now, as specialist hi-fi dealers only make up a small proportion of outlets for the audio market generally. Although we don't discount any audio retailers from taking part it is true to say that our correspondents almost certainly wouldn't be able to sell you a fridge as well as a stereo. *Choice* encourages buyers to use the specialist dealer who can usually offer better service and advice than the electronic superstore chain's white-socked shop assistant. Many dealers now offer two-year guarantees for instance. And most offer free installation of equipment if it needs it; dealers like The Cornflake Shop and Grahams in London employ permanent installation staff who use their cartridge alignment gauges as easily as teddy boys use their combs. The nature of the survey also means that it only covers the more common brands widely stocked by dealers such as: Denon, Yamaha, Marantz, Nakamichi, Rotel, Sony and NAD.

This is *Choice's* fourth look at cassette decks since April 1988 and we have replies from 41 dealers covering 24 brands. Cassette decks are far less

prolific than loudspeakers. For instance, for our last loudspeakers survey we had replies covering 70 brands on the market.

As yet there is no British manufacturer of domestic cassette machines and none trying to steal a march on the Japanese either. Arcam (in Cambridge) did consider producing a cassette deck so that it could offer a complete system line-up to compete with the likes of Technics, Rotel, Denon et al. But even with the idea of sourcing all the components from the Far East the British maker has shelved such a project.

RELIABILITY

Being born outside the marriage-to-sound-quality ideal to which vinyl and compact disc players aspire, cassette decks are also not the most reliable of hi-fi components.

One dealer who is not impressed by build quality is Brian Peaston, of Holborn Hi-Fi. "The quality of construction has gone down on budget cassette decks costing up to £200," Mr Peaston informed *Choice*, "five years ago £150 was equivalent to about £250 today. But manufacturers keep cutting down on build quality to keep prices level. And companies keep changing their ranges every year because it's too expensive to build the model at that price." Peaston added that in his experience Denon was the only exception to this rule.

While build quality was not of great concern to other dealers, several of whom are impressed by standards of reliability compared to a few years ago, all agreed that a cassette deck needs regular cleaning to avoid breakdown. Peaston again: "Of all the parts of a hi-fi system the cassette deck is the most vulnerable. This is because it is the most mechanical and so more care and attention should be taken to clean the heads and idler wheels to keep everything up to scratch. It's very common that people come in and say: 'it's gone dull' or 'one channel has gone down', that's usually because the machine has become dirty."

And confirming Peaston's comments, Mike Corrin of Island Compact Discs told us: "Nine out of ten cassette decks with

problems are due to dirty heads." The specialists agreed that the best method of keeping a cassette deck clean, and therefore working, is to use some pure alcohol (Isopropyl) and cotton wool buds. Cleaning should be done every nine or ten hours of use and every time before recording for optimum results. Where use of cotton wool buds is impossible (if you suffer from delirium tremens for example) then dealers almost universally recommended the Allsop 3 cleaning kit which costs a fiver. This kit is also useful for cleaning the in-car system where reaching the heads with cotton buds is often impossible. Mario Binner, of Audio South, told us that for systems with auto-reverse (such as most ICE) a better kit than the Allsop 3 was the ACC5 marketed by AM of Denmark.

Along with cleaning, several dealers recommend demagnetising kits such as the hand-held Milty *Magnett 1X Demagnetiser* (around £8) or Nakamichi's audiophile *DM10* for £30. Caution was advised over the compact cassette variety of demagnetiser but Mario Binner recommended the Koss *KED 1* at £9.95. "It's fine, I use it every six months on all my decks here; you turn all the volumes down and just run it for a second," Binner informed.

If you follow these rules a cassette deck should give years of sweet-sounding service, though the consensus was that if after five seasons' regular use your deck is behaving perfectly then you're into stoppage time. To get an idea of manufacturers' quality control measures we asked dealers for a percentage of decks which arrive faulty and

calculated a mean 3.2 per cent. It's not a bad figure – slightly up on our April findings – but is useful in that there were far less 'zero' comments than we get with turntables or loudspeakers, say.

We also asked dealers to name their most reliable and unreliable brands and calculated the results on a points system. Where there are plus and minus points against a company we noted the difference. The most reliable brand, confirming that money buys build quality, is Nakamichi which scored 62. That was followed by Denon (40), Technics (39), Yamaha (37), Rotel (19) and Sony (18). The only brands scoring significant minus points were Aiwa and Marantz.

When it comes to repairing cassette decks most dealers will do so themselves which is a quicker option than having to send the deck back to the manufacturer. When that happens you can expect to be without taped music for around three weeks on average. We asked dealers to tell us the fastest and slowest brands with whom they have to deal for repairs and got positive comments regarding Yamaha, Technics and Nakamichi. Slow brands were given as Marantz (about seven weeks) and Denon (around five weeks). Marantz told us they recognised a service problem at present and were endeavouring to sort it out. Denon also received comments for rapid delivery giving it a kind of love/hate status with dealers. But Rob Follis, for importers Hayden Labs, claimed that his service department was "up to date" and hitting the aspirational 24-hour turnaround on all equipment at present.



Denon DRM-07 (above): long in the tooth but still leading the pack.

THE BEST SELLERS

We asked dealers for their top three best-selling cassette decks in three different price brackets. The results are calculated on a points basis: five for the first, four for the second, three for the third and then added up.

Budget Category (below £150)

Denon <i>DRM07</i>	139
Yamaha <i>KX230</i>	42
Aiwa <i>AD-F270</i>	31
Yamaha <i>KX200</i>	26
Technics <i>RSB355K</i>	24

Denon's almost embarrassing lead over the competition confirms the brand as number one among the specialists with the numbers of the *DRM07* selling in excess of "four figures every month" according to the firm. After two-and-a-half years the model is getting a little long in the tooth though and will be replaced by the *DRM-400* in November. Denon says the *DRM-400* offers better build and sound quality with the likes of two transport motors and will cost £130 – a fiver more than the *DRM-07*.

Best Sellers £151-£400

Denon <i>DRM-500</i>	97
Denon <i>RDM24HX</i>	82
Denon <i>DRM12HR</i>	62
Nakamichi <i>CR2E</i>	39
Nakamichi <i>CR1E</i>	36
Yamaha <i>KX500</i>	35

Again it's Denon-and-on with the picture looking much the same as previous surveys. The *DRM24HX* had just been replaced by the *DRM-800* and *DRM12HR* is upgraded to *DRM-700*. Our figures take account of these upgrades although most dealers were citing the old model numbers.

Top Price Best Sellers (£401 plus)

Nakamichi <i>CR3E</i>	78
Nakamichi <i>CR4E</i>	44
Denon <i>DRM44HX</i>	36
Aiwa <i>KXO-09</i>	31

Nakamichi is still obviously regarded as *the* cassette deck for cognizant users of compact cassette; Denon's \$400 top-of-the-range model here has been deleted and will be replaced by the (again \$400) *DRM-1000* deck featuring the new Dolby S recording system in the new year.

PARTICIPATING DEALERS

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

Active Audio, Derby, Derbyshire.
Aerco Ltd, Woking, Surrey.
A Fanthorpe Ltd, Hull, Humberside.
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DENON

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



CHOOSING AND USING . . . CASSETTE DECKS

The unique feature of Compact Cassette is, of course, the ability to record. But it should also be stressed that musicassettes are a major source of prerecorded music, outselling LP and CD combined. The cassette has done for the music industry what the transistor did for radio, providing 'go anywhere' flexibility in portables, personals and in-car variations.

The most obvious recent trend in domestic mains machines has been towards the double 'dubbing' deck, fitted with two transport mechanisms. In the past the prevailing standards of these decks has been very poor, but matters have improved somewhat and almost one half of the latest test group is of this type.

REPLAY

Nowadays the best prerecorded musicassettes can give very respectable quality, so the ability to get the best from musicassettes is a valid assessment for any modern cassette deck.

The task requires a good quality tape transport mechanism and replay head, plus careful alignment of heads and electronics. Although international tape equalisation and noise reduction standards do exist, not all cassette deck manufacturers are equally good at adhering to them. The result is that many decks perform less well on replay only than they do within the 'closed loop' of record/replay, and our reviews pay attention to this.

RECORD/REPLAY

In some ways record/replay is easier than replay only, insofar as head alignment, Dolby tracking and equalisation errors can cancel out and compensate for each other. However, any inherent transport problems are likely to be exaggerated, and there is now a still greater premium on the quality of the record head, particularly if metal



A button pusher's dream – but it pays to choose carefully, as audible differences between cassette decks are quite obvious.

tape is likely to be used. To get a decent quality recording, a deck needs to be accurately aligned electronically for a sensible range of different tape types; some machines offer variable bias for 'fine tuning' to specific tapes – a useful facility for those prepared to take the trouble.

Good quality metering set to the right sensitivity level can be a boon, though in time and with practice a cassette deck owner will probably gradually come to learn the 'right' meter level for getting most signal without compression onto a specific type of tape.

TAPE TYPES

Though there are three formal groups of tapes, Types I, II and IV, there are variations within

each group which further confuse. In brief, the best advice is to find a tape in each group which suits the set-up of the recorder, and then stick to it. (But note that the tape manufacturers have an annoying habit of re-mixing formulations regularly without changing the brand identity.)

The very cheap ferric tapes are not hi-fi quality, so it is better to go for premium Type I ferric from a reputable brand for general purpose use. A Type II chrome or pseudochrome will give a step-up in quality, while Type IV metals can turn out to be the cat's whiskers on some decks – but may not work too convincingly on others. Perversely, the very best decks can produce stunning results on the better quality Type

I ferric tapes.

FEATURES

No other component fulfills a button pusher's dream like a cassette deck. The bare essentials boil down to tape selection (nowadays generally automatic), and Dolby B noise reduction (necessary for musicassette replay but optional for record/replay).

A host of imaginative inessentials will either enhance the enjoyment or baffle the user, depending upon temperament. Microphone inputs are fast disappearing, but headphone sockets remain. Most decks now include Dolby C noise reduction, and a few still have dbx. Dolby *HX Pro* is used by an increasing number of decks, and reduces high frequency compression with Type I and II tapes. It is *not* a noise reduction process.

Electronic logic control may supervise an almost silent transport system, giving the potential for microprocessor-controlled track search and programming systems; for auto-reverse to extend play or record times; and for automatic or semi-automatic tape tuning in the more expensive machinery. Bias 'tweaking' enhances tape matching, while replay EQ may be trimmed for optimum replay response on some machines.

CHOOSING

Having weighed up the pros and cons of your own priorities and requirements, and having studied our reviews, it's not a bad idea to audition one or two likely contenders. A comparison with something really good is almost essential to establish a quality yardstick when trying to assess how much you will need to spend to achieve the desired level of performance.

The hi-fi enthusiast may not take the purchase of a tape deck as seriously as he would the selection of, say, turntable, arm and cartridge, but audible differences between machines are no less obvious.

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AIWA AD-F270

AIWA (UK) LTD., UNIT 5, HEATHROW SUMMIT CENTRE, SKYPORT DRIVE, WEST DRAYTON, MIDDX UB7 0LY. TEL: (01) 897 7000.

BEST BUY



Selling at just under the £100 price break, the bottom of the range Aiwa AD-F270 is fairly sparsely equipped, as you'd expect. But not that sparsely. The deck is built around a traditional set of mechanical transport actuators positioned just below the cassette loading door. The controls can be locked into a position ('record' or 'play') and the unit left connected to a timeswitch for unattended operation.

In contrast to some low cost players, the Aiwa has full auto-stop in all modes, fast forward and rewind included. The meters are also better equipped to do their job than some. Certain low cost designs don't have stereo metering (though they may show levels in two columns, implying stereo operation), but this isn't the case here. Of course they're fairly rudimentary otherwise, covering just 16dB in five steps.

The low cost Aiwa has both Dolby B and Dolby C noise reduction, worth about 10dB and 20dB on the raw signal/noise figures respectively. Amongst the very few remaining controls there's a simple mechanical tape counter, a headphone socket (fixed level of course), a large input level control and a much smaller balance control. I was surprised to find that the Aiwa is also equipped with a fine bias adjustment control, but less surprised to find that it operates on Type I and II (ferric and chrome) tapes only.

LAB REPORT

The limited HF headroom is clearly shown in the high frequency intermodulation test result, indicating that the electronics are drifting seriously from their linear area of operation when fed hot, high level/high frequency signals. However, the standard signal/noise and harmonic distortion figures measured to 0VU are very satisfactory in each case. Overall, the Aiwa suffers an approximate 2-3dB penalty in operating dynamic range compared to typical decks costing, say, £150-£200. Although this means that the Aiwa doesn't have the effective noise-to-distortion separation of some, it remains more than satisfactory for a low cost deck.

On the whole the frequency response results are very good. The bass end is better than most, the response shape being well extended and relatively free of the usual

head contour effects. The mid and top end response shape for all three tape groups is astonishingly flat (ie accurate). And these results would be creditable on a deck costing twice or three times as much. Playback response linearity isn't quite as good. There's a 2dB response rise over 10kHz despite a 40 degree head azimuth error measured at 10kHz. However, it's not uncommon to find that an initially rather fierce top end becomes a little less pronounced as the deck wears in, especially with the softer heads commonly employed in budget designs.

Finally, the transport has extremely low wow figures, but a significant quantity of higher frequency flutter artefacts. But again there's nothing here that's not in line with expectations at the price.

SOUND QUALITY

There is some mechanical noise from the transport, and the transport keys are rather close together and stiff with the result that on some surfaces the whole deck is inclined to slide when it's put into play or record modes (these are the stiffest). The controls are agreeably positive and free of slack, however.

The companies who produce recorded cassettes are often rather cavalier about the levels they peak to (presumably to gain a volume advantage and to hide tape hiss) and there were occasions where recordings were clearly pushing the deck into the terminal area of aural cotton wool that indicates compression. The measured brightness was less of a problem, and in many cases passed unnoticed, due perhaps to a mild but pervasive sense of warmth and laziness at the opposite end of the audio frequency band.

That warmth and laziness was also present with native recordings, but on the whole the deck's shortcomings turn out to be surprisingly modest, even benign. There is the expected loss of midband clarity, and stereo images tend to sound a touch amorphous, whilst low frequency definition is naturally limited. Yet piano tone is remarkably (I use the word advisedly) stable and firm.

The deck is happier with Dolby C than Dolby B when dealing with wide dynamic range material simply to achieve a sufficient level of hiss reduction, but although Dolby B made livelier, cleaner recordings, the differ-

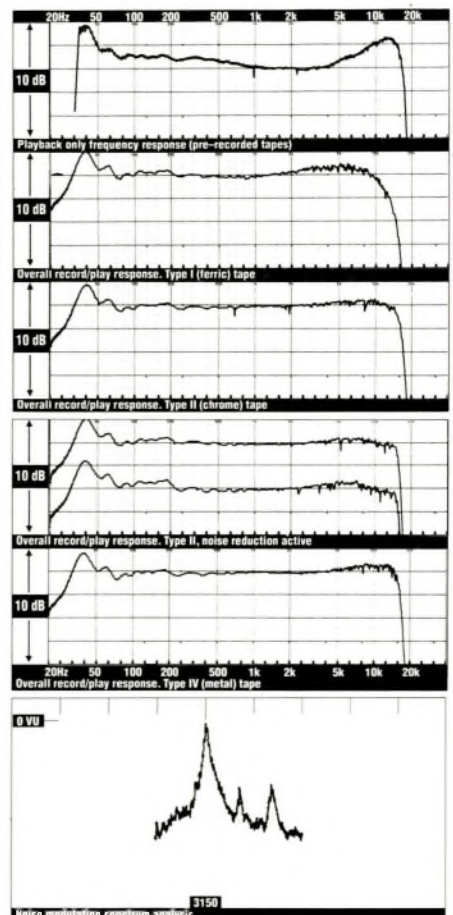
ence again was subtle. With certain types of music all that could be reliably determined was a change in the noise floor.

CONCLUSIONS

This simple deck has all the basic requirements plus a fine bias control to help ensure a good match of tape to machine. Although it is possible to pick holes, the criticisms pale when judged against the low selling price and the more than respectable audio performance. This deck is one of the top handful at the price, and perhaps the best.

TEST RESULTS

Dolby Level (on cassette deck meters)	+ 3dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	20Hz - 14kHz
IEC Type II	20Hz - 17kHz
IEC Type IV	10Hz - 17kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.13%/0.25%
Wow/Flutter Peak DIN wtd	0.08%/0.25%
Speed error	+0.3%
Type I signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	0.8%
Type IV signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.50%
Channel separation 0VU/1kHz	65dB
Line input sensitivity/overload	125mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	685mV/2.3V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	32%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	+ 6dB
Dimensions (w x h x d)	43 x 13 x 23.5cms
Typical retail price inc VAT	£99



AIWA AD-WX777

AIWA (UK) LTD., UNIT 5, HEATHROW SUMMIT CENTRE, SKYPORT DRIVE, WEST DRAYTON, MIDDX UB7 0LY. TEL: (01) 897 7000.



The AD-WX777 is no bare bones recorder. It has one record and one playback only transport, both of which are auto-reverse capable. The transports are equipped with quick acting optical mechanisms which trigger the side change as soon as the leader is detected. Both transports also boast cassette shell stabilisers, which help prevent resonance from this source, a fairly recently recognised and esoteric cause of sonic degradation.

Another rather unusual feature with low cost twin decks is a bias adjust feature. This last is both less and more than it seems. Less because the facility isn't extended to metal tapes, presumably because the electronics and/or heads won't handle it, but more because there are separate bias pots for Type I and II (ferric and chrome) tapes, which means that one tape type from each group can be left adjusted at the same time.

One minor snag with this deck (and many others of its type) is that whilst the main status display area has no shortage of illuminated indicators, the legends and markings that accompany them are unilluminated, or as here positively obscured behind a layer of what appears to be darkened plastic. On the other hand, the logic transport controls are good. Both control key sets are gathered together amidships, between the two transports, and with the display area immediately above they become a natural central focus for attention.

The range of features not so far mentioned is pretty well par for the course, not to mention par for the price. The record level meters cover an adequate 30dB in seven steps. The displays also include a simple mechanical tape counter for the record transport. The 777 will dub tapes at normal or double speed, requiring just one key touch to start the process. Sequential playback is also possible, but it would have been a major surprise if it wasn't possible. However, I was surprised to discover that Dolby HX Pro is not a part of this machine, since Aiwa is a long time protagonist of this system.

LAB REPORT

Given that the Aiwa is equipped with not one but two low(ish) cost auto-reverse transports with all the compromise this entails, transport performance is remarkably fine. Wow and flutter is extremely low on the

record/playback transport (deck 2), though the figures are about 30 per cent worse on the play-only deck 1, using the test tapes recorded on deck 2 of course. But even these results are very impressive for this class of machine, and in confirmation of this the spectrum analysis plot is as good as that for many of the more expensive models tested. The contribution of the most annoying effect of all, low rate wow, is minimal.

The 777 also offers an unusually wide working dynamic range, up by a couple of dB compared to most of its nearest equivalents in the Type II test, which gave the most impressive results. However, the IM test result shows that the electronics don't have unlimited headroom.

The frequency responses are mostly satisfactory, though the LF end of the curve is indicative of low cost design compromises.

SOUND QUALITY

My recorded tape test fleet sounded bright and thin. The Aiwa added a piercing quality to female vocals and an oddly etched overlay with certain classes of percussive sounds (xylophones, cymbals, etc). In addition, the high frequency band tended to sound forward whilst the midband receded, effectively second guessing the original production values. I don't want this to be seen as too damning an indictment as it didn't sound bad. The 777 was simply guilty of a certain amount of creative misinterpretation. All the other musical attributes were pretty good, except perhaps in the deep bass which was a touch lightweight.

Strangely enough, when making and playing recordings in its own right, the bass is one of the deck's best features. Although it's neither as powerful nor as solid as the very best, it is more than adequate on both counts, and in addition it offers a warmth and depth denied many nominally comparable recorders. The bass also has the ability to breathe. It ebbs and swells with the music in a thoroughly convincing way.

The high frequency end, however, is a little less praiseworthy. There's a somewhat synthetic quality here, noticeable with orchestral strings and the upper reaches of piano and voice. But if you view the recorder as a whole, the standard of performance achieved is first class. The deck drives metal

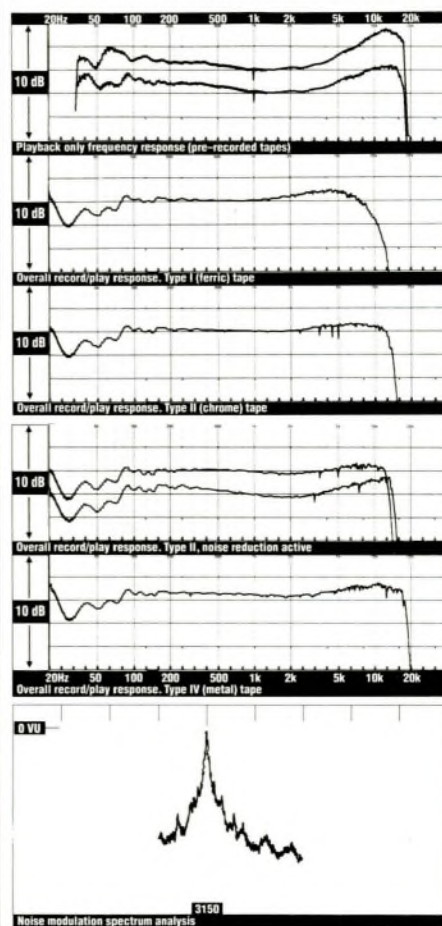
tapes to great effect for a free, open sound even in the high frequency range, and dynamic range is wide enough to make Dolby B viable where some decks require (and suffer) Dolby C.

CONCLUSIONS

The tonal anomaly with prerecorded material is one of the only real criticisms of a particularly well engineered and engaging dual auto-reverse cassette deck. Pricing is keen, and a Best Buy rating is practically mandatory.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	<20Hz - 12kHz
IEC Type II	<20Hz - 14kHz
IEC Type IV	<20Hz - 18kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.08%/0.15%
Wow/Flutter Peak DIN wtd	0.04%/0.13%
Speed error	+0.03%
Type I signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	0.45%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.8%
Channel separation 0VU/1kHz	63dB
Line input sensitivity/overload	84mV/>13V
Mic input sensitivity/overload	n/z
Line output for 0dB/maximum	600mV/2.9V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	2.6%
Azimuth check R-L phase at 10kHz	Deck I FWD/REV - 60°/30° Deck II FWD/REV - 75°/30°
VU indication at IEC 0dB	+3dB
Dimensions (w x h x d)	43 x 14 x 30.5cms
Typical retail price inc VAT	£179



AIWA AD-F700

AIWA (UK) LTD., UNIT 5, HEATHROW SUMMIT CENTRE, SKYPORT DRIVE, WEST DRAYTON, MIDDX UB7 0LY. TEL: (01) 897 7000.



Aiwa's middle market *AD-F700* is a straightforward two head cassette deck with a distinctively modern look and blend of facilities. As usual with this marque, the *AD-F700* is fitted with Dolby HX Pro headroom extension circuitry designed to reduce high frequency wow and flutter figure of 0.06 per cent weighted. IM distortion is rather high, and with IEC 0dB at 3VU, the amount of headroom available for level hungry tapes – and in particular the better metals – is rather limited.

Tape search aids include audible cueing (hold either fast wind control down in play mode and you hear – very faintly in this case – a speeded up version of the recording). Aiwa has also fitted an electronic tape counter which offers a choice of memory stop or replay, along with some limited repeat modes.

The deck doesn't have microphone inputs, but there is a headphone socket complete with volume control. There's also one unusual feature in the form of a second line input, labelled CD Direct, which is normally used to accept a direct feed from a CD player with two outputs. But note that if the CD feed is channelled through a volume control, and especially if it passes through an electronic volume control (the ladder type which operates in discrete steps), you may achieve better sound using the main system amplifier tape feed in the usual way. One way around this problem is to leave the CD player output volume control set at maximum.

LAB REPORT

PCC-OCC wiring is used in the amorphous record/playback head, which has a hyperbolic profile to reduce contour effects. The cassette loading drawer is fitted with a clamp (AMTS in AiwaSpeak) to help suppress structural resonances within the structure of the cassette itself.

The good tape path geometry pays off in the low frequency behaviour which is very linear and flat. But the IEC Type II (chrome) response run showed a significant top end boost at the standard position of the bias control. Naturally the two Dolby plots merely exaggerated the error, Dolby C more than Dolby B as expected. The playback only response shows a little over-equalisation in the bass, but an extremely accurate mid-

range and treble up to about 10kHz.

The transport is excellent, as is usual with Aiwa. Wow and flutter are both well contained, and the spectrum analysis is clean, which matches in with the good combined wow and flutter figure of 0.06 per cent weighted. IM distortion is rather high, and with IEC 0dB at 3VU, the amount of headroom available for level hungry tapes – and in particular the better metals – is rather limited.

SOUND QUALITY

Unfortunately there was a perceptibly synthetic quality about this deck – the electronics didn't sound completely transparent. I've encountered this kind of quality before, often with quite expensive and ambitious products where the design project has been undertaken 'by the book' without reference to well informed music based listening tests.

It's true that recorded musicassettes were handled quite well. The Aiwa has an emphatic style of delivery with what appears to be very good analysis. The bass sounded full but without waffle. At higher frequencies, however, the deck tended to sound on the thin and wispy side of reality.

The same qualities were apparent when recording. High frequency reproduction was, well, off. It certainly wasn't natural: the Aiwa has a cluttered quality and demonstrated a lack of separation even though the superficial impression of detail remained strong. Although results tended to vary from recording to recording, orchestral string tone was often quite badly hit, recordings sounding grainy and lacking the usual natural sheen and polish. Piano tended to suffer from rather different though possibly related shortcomings – a shortfall of coherent depth and weight clues, and an inability to present transient leading edges cleanly and without overhang.

Dolby noise reduction did little to spoil the sound once the bias level had been adequately tweaked, but the inherent resolving power of the Aiwa might not have been enough to show relatively subtle effects. I formed no very strong preferences between the various tape types. Metal tapes in many ways sounded sharper and cleaner in the treble, and the bass tended to sound sharper too, but these things did little to affect the

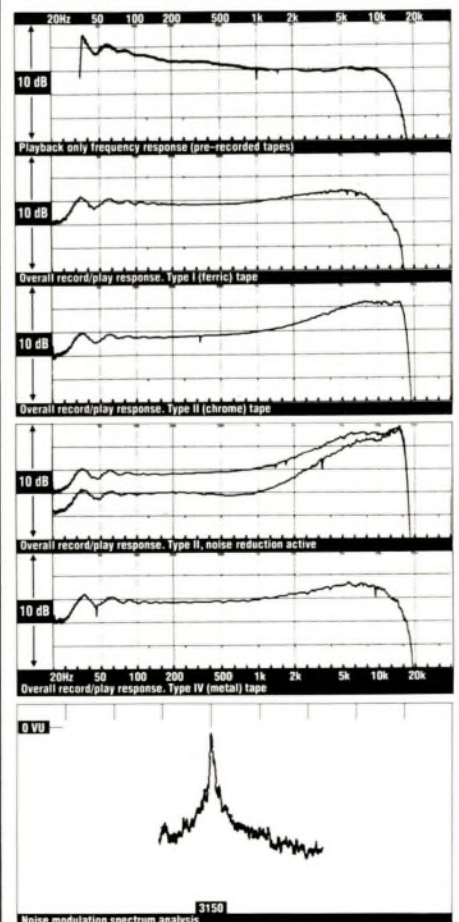
Aiwa's more fundamental shortcomings.

CONCLUSIONS

Creaky build quality and a synthetic standard of sound quality are belied by the smart appearance and good facilities. The *AD-F700* follows trends seen in some other medium cost Aiwa cassette decks, but takes them to excess in a package that unfortunately lacks serious audio potential. A pity this, since the ingredients list looked so promising. The problem must lie with the cooking – and of course the cook.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	20Hz – 14kHz
IEC Type II	20Hz – 18kHz
IEC Type IV	20Hz – 18kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.06%/0.13%
Wow/Flutter Peak DIN wtd	0.05%/0.13%
Speed error	+0.3%
Type I signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	55dB
distortion 0dB	0.8%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.9%
Channel separation 0VU/1kHz	57dB
Line input sensitivity/overload	82mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	788mV/3.9V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	4.5%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	43 x 14 x 32cms
Typical retail price inc VAT	£199



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AIWA AD-F800

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BEST BUY



You've had 'em, honeychicks, listen to three-head, dual capstan deck which allows for tape monitoring in real time, that is concurrent with the recording itself. The cassette well is illuminated, and along with the display and control area is very cleanly designed, fairly exuding class, though the minor switching associated with the Dolby and memory circuits (etc) is fiddly and could have been handled better. The display has a high quality 30dB range display (sans peak hold), and the deck also has a simple electronic tape counter with auto-stop or auto-play as options. A number of simple repeat and auto-return facilities are available too.

All three standard Dolby circuits are fitted – Dolby B, C and HX Pro – the first two doubled up for real time monitoring. MPX filtering is switchable, and tape/source switching is manual. The *F800* also has such refinements as a second line input (CD/DAT Direct) and a variable level headphone outlet. The transport control system is solenoid driven and includes audible cueing. There's even a rudimentary tape calibration system, consisting of a fine bias control and a similar one for sensitivity, labelled incorrectly as 'rec level'. The latter is important to help ensure correct Dolby tracking on replay.

The *AD-F800* features a high tech transport with closed loop drive dual capstans, where tape tension across the heads is independent of tension applied between the two hubs of the cassette, being determined solely by the two capstans on each side of the head block. The latter is described as a 'bias shield', presumably to screen the rest of the circuit from high frequency signals related to the bias voltage. The Super DX record and playback heads are samesed and wound with PC-OCC windings. The deck also employs Aiwa's proprietary cassette clamp which is built into the fixed loading door. Access for cleaning remains quite good.

LAB REPORT

The promise of dual capstans and the fine engineering evident by examining the transport is realised in unusually good wow and flutter figures, the analysis showing low flutter and almost negligible wow. The head azimuth error was also negligible, but using prerecorded material the response shape is obviously saucer shaped, which is bound to

mean a touch of tizz and boom on a basically good (viz: smooth and extended) balance.

As a recorder, the responses shown were run using the standard central setting of the bias and sensitivity controls (the latter is irrelevant in this context except in the case of Dolby, of course). The Type I and IV shapes are satisfactory, but Type II shows a substantial top end lift which is partially correctable as described. The small residual Type IV error can be corrected quite accurately, though the central position is actually very close to providing the least perceptible A/B differences – that is between source and tape. The signal/noise and distortion figures are satisfactory, but note the high level of 0VU intermodulation distortion.

SOUND QUALITY

It's easy to pick fault with this deck. More to the point perhaps, it's obvious where it departs from the straight and narrow. For example it's easy to demonstrate that the Aiwa lacks the almost tangible presence that can be had (given the right musical material and a following wind) from any fine hi-fi system. There's a coolness and an occasional lack of low-end focus, betraying the Aiwa for what it is – a cassette deck.

Yet with a good tape loaded and set up accurately using the level and bias pots, the deck came close to breaking the mould for a £250 design. The electronics sound much less processed and, well, *electronic* than most of the others at this price level (and all the cheaper Aiwas). In the final analysis, the bass end remains just slightly loose, but the mid and top are marvellous. Using high grade (preferably metal) tape stock, the Aiwa can be fairly characterised by tremendous neutrality, energy and resolution, combined with first rate transients, image focus (albeit shortened in the depth plane) and speed.

I am a little ambivalent about the sound quality of prerecorded cassettes. They benefitted from all the fine qualities already discussed, but the added brightness became tiresome with some material (close miked rock/pop for example) and the bass sounded fuller and looser.

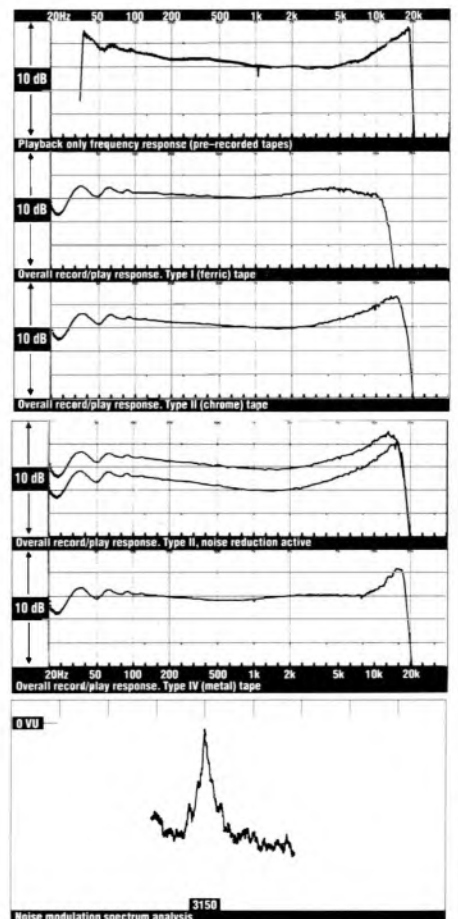
CONCLUSIONS

Best Buy. I suppose that this model, which is one of about 40,000 models currently listed

by Aiwa (count 'em), is particularly directed at the indigent audiophile. The £249 asking price is serious money for a cassette deck, but hardly in the super-fi league, or even Aiwa's own predominantly low and middle market super-fi league. Yet the blend of facilities is very much serious hi-fi in intent. Almost all are designed to improve sound quality in some fashion. Very little effort appears to have been expended on mere convenience features, though the deck has an artless straightforwardness that should win it many friends on those grounds too.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	<20Hz – 13kHz
IEC Type II	<20Hz – 19kHz
IEC Type IV	<20Hz – 19kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.05%/0.07%
Wow/Flutter Peak DIN wtd	0.04%/0.06%
Speed error	+0.1%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.8%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.6%
Type IV signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.8%
Channel separation 0VU/1kHz	72dB
Line input sensitivity/overload	83mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	750mV/3.8V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	6.0%
Azimuth check R-L phase at 10kHz	10°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	43 x 14 x 32cms
Typical retail price inc VAT	£249

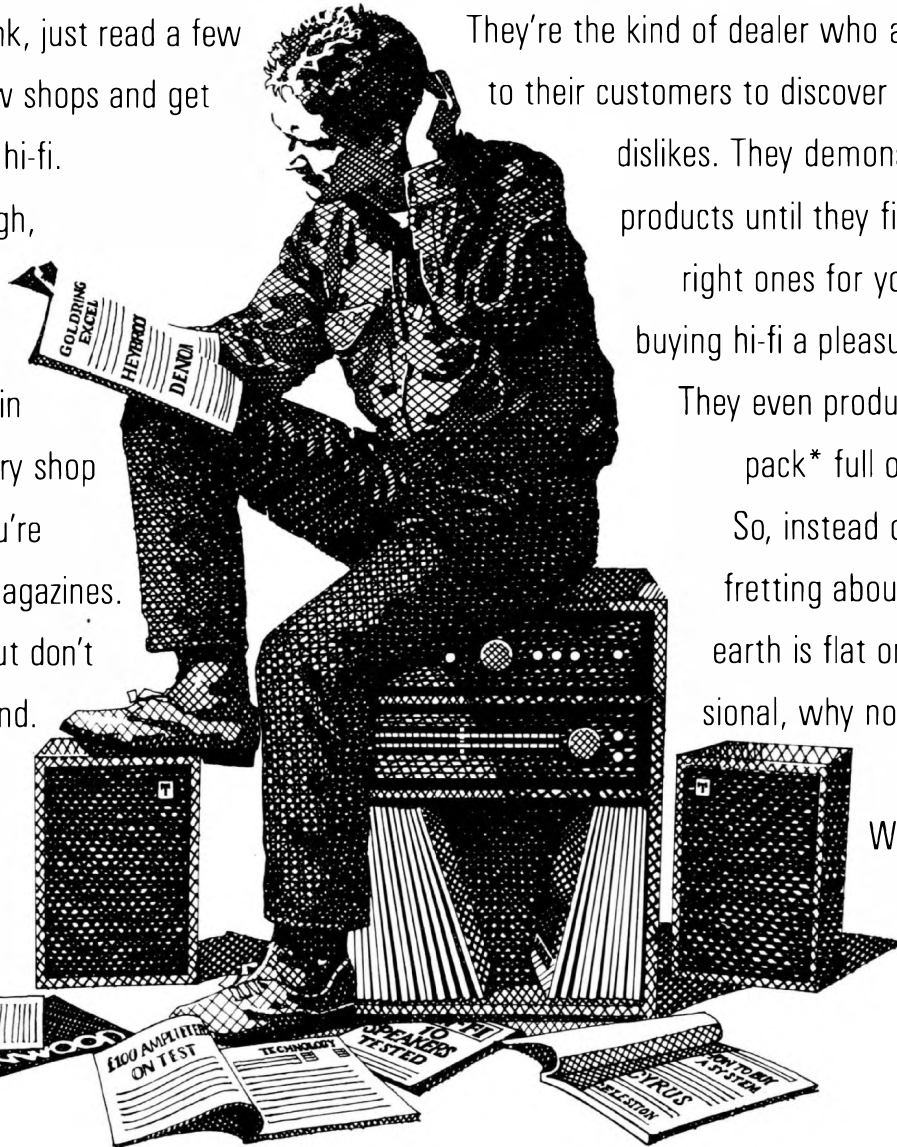


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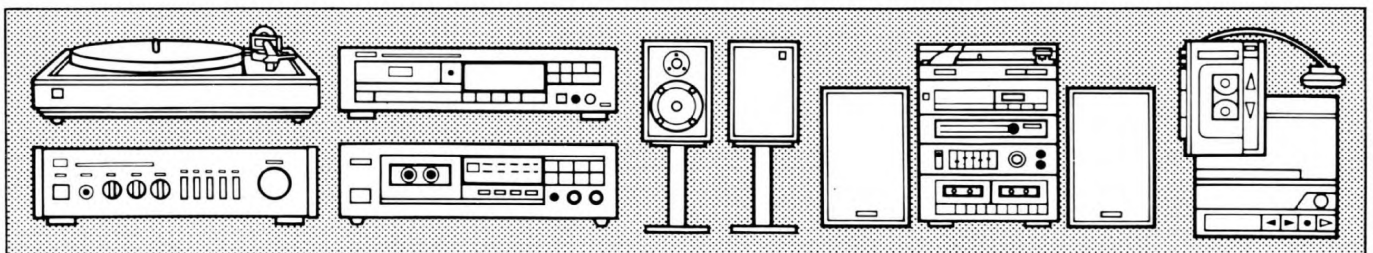
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AIWA AD-WX888

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RECOMMENDED



This smartly turned out model perfectly illustrates the way unidirectional deck features eventually find their way into utility dual transport models. In this case, we have a deck with such fashionable features as amorphous heads with PC-OCC wiring and tape stabilisers on both transports which rejoice under the AMTS banner. AMTS you'll be thrilled to discover stands for Anti Modulation Tape Stabiliser.

This is a high spec machine – and incidentally, a high perceived value one too. Although only one of the two transports records, they're both capable of auto reverse operation, which amongst other things means that both sides of a tape can be dubbed in a single (probably completely illegal) take. Aiwa was quick to support Dolby HX-Pro, and this model is so equipped, along with the standard Dolby B and C.

On the whole, the control and display section of the player is very well organised. Amongst other things, the display window includes 30dB two colour peak reading record level meters and two electronic tape counter displays. Each counter has its own reset key, but there's no memory stop feature, and the counter loses its reading when power is switched off.

The transport controls are laid out for fast intuitive operation, with two play keys (one for each direction) flanked by fast forward and rewind interlinked for full audible cue and review operation. Along the bottom of the fascia are controls for synchronised dubbing at normal or high speed (both one key operations), input level controls (in the form of master and balance rotaries) and separate fine bias controls for Type I and Type II tapes. There's no bias adjustment facility for Type IV tapes.

LAB REPORT

Common to all the frequency responses are some moderately severe head contour effects, a sharp ringing that results in a wavy LF output which peaks well above 50Hz and falls off sharply below. Even here there are differences between the two transports, as the plots show. At high frequencies too differences persist, which is why two curves are shown on each of the record-replay traces. The upper trace is produced by the record/playback transport, the lower one is from the

playback only transport, having been recorded on the other transport. The Dolby traces refer to the record/play transport only of course. Using the standard IEC tapes for measurement purposes, the fine bias adjustment pots were set centrally.

The Type I test produced an essentially flat response up to the 14kHz or so that represents its practical limit. The Type II tape is underbiased, but can be largely corrected with the bias pot. Type IV (metals) were also somewhat awry at high frequencies.

Whatever differences are exposed between the two transports, the speed and wow and flutter figures turned out to be almost identical. Nor is there any substantial measured difference between the two directions, which is unusual. The figures are surprisingly good for this class of equipment.

SOUND QUALITY

For the most part, and making due allowances for the complexity of the features on offer, the sound quality prognosis is favourable. Prerecorded tapes are a little bright and the bass is slightly shallow and 'boppy' but tapes sound very clean and stable, and there's plenty of midband layering and subtlety to hold the interest. The play only transport sounds a little better in the bass.

Moving onto the record/playback picture, there's a distinction to be drawn between the standard of performance with ferric and chrome on one hand and metal tapes on the other. The latter suffered badly from the poor response linearity (or lack of a variable bias control), and recordings made on metal tapes typically sounded thin with a prominent, forward upper midband combined with a loss of weight, body and timbre. The effects were exaggerated with Dolby processing, especially in the case of Dolby C. The other tapes, suitably corrected for a flat balance (which is time consuming and rather uncertain with this type of deck) gave very much better sound quality.

Type II then was the optimum tape group for this recorder, and it makes good use of the recent high energy, low noise types from the top of the ranges of producers like TDK, Sony and others. Bass is lean and not very deep, though this was only noticeable in a genuinely wide bandwidth system. A high standard of low frequency pitch integrity car-

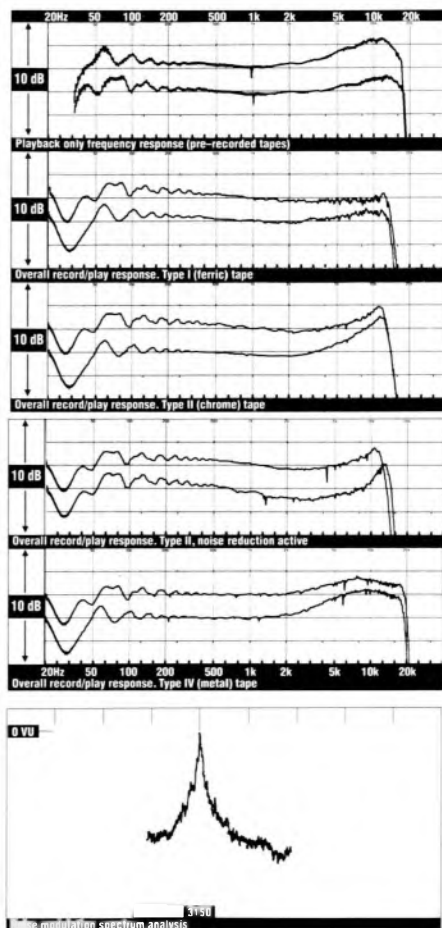
ried it through in most situations.

CONCLUSIONS

Good value – Recommended. This complicated but understandable deck is roughly comparable in sound to a good single transport model in the £180 to £200 price area, and gives a clean, accurate sound with most tape types. Shortcomings are few, but include the absence of a bias adjustment pot for Type IV tapes, a tape counter memory or track search, and a slight 'drawing in' of the dynamic and spatial extremes.

TEST RESULTS

Dolby Level (on cassette deck meters)	+1dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	20Hz – 14kHz
IEC Type II	20Hz – 14kHz
IEC Type IV	20Hz – 19kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.08%/0.18%
Wow/Flutter Peak DIN wtd	0.05%/0.16%
Speed error	FWD/REV +0.03%
Type I signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.8%
Type II signal/noise CCIR/ARM 400Hz	57dB
distortion 0dB	0.95%
Type IV signal/noise CCIR/ARM 400Hz	52dB
distortion 0dB	1.3%
Channel separation 0VU/1kHz	70dB
Line input sensitivity/overload	11.5mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	680mV/3.0V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.16%
Azimuth check R-L phase at 10kHz	FWD/REV 0°
VU indication at IEC 0dB	+3dB
Dimensions (w x h x d)	43 x 14 x 31.5cms
Typical retail price inc VAT	£249



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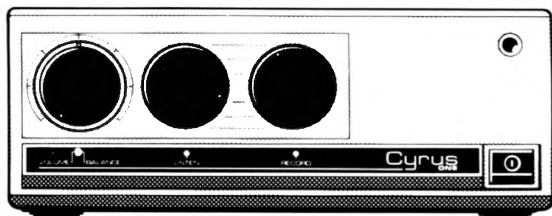
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DENON DRM-500

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BEST BUY



In its time the Denon *DRM-10HX* has carved itself a niche as a strong budget performer; and at the same time has helped cement the status of the marque. This new model, which will form the basis for several new models due for release over the coming months, is a logical progression from the earlier model.

Most of the features are similar, and will in any case be familiar to the student of budget cassette deck design. But the deck does get a completely new suit of clothes. The display area is a little crude – the meter scale for example is almost indecipherable – but the rest of the design is modern and well proportioned, bringing it broadly into line with the best of the rest.

What the *DRM-500* Has Got Dept: The highlights include Dolby HX Pro along with the normal Dolby B and C (of course) and associated MPX filter switch. The main record/playback head has a hyperbolic profile which helps eliminate head contour woodles. A variable bias control addresses all three tape groups. The tape counter is manual, but there's a separate memory facility. To increase the scope of the tape search aids the deck also has a next/current track search feature. The deck is fitted with system remote sockets and a headphone socket.

All these features were also found on the *DRM-10HX*, either in a very similar form or absolutely identical. However, the *500* does have one new feature in the form of a button labelled 'rec return'. It does what it says, aborting a recording in progress, rewinding to its start point and re-entering record/pause mode ready for the off.

Unless my memory is playing tricks, there's been something of a retreat on the transport front. The *DRM-10* had a very quiet acting transport indeed. This one makes all kinds of clanking noises as it goes about its business, though it's by no means the worst in this respect. For the most part however, the Denon is pleasing to use and a sound ergonomic proposition. One important omission – there is no timer standby facility.

LAB REPORT

Denon claims a couple of extra dB signal/noise over the *DRM-10*, but this wasn't found to be the case. However, the new figures are quite good, and differences in test tapes used accounts for at least some of the numerical

shortfall. Take it that at this price level, the *500* offers low noise and excellent headroom.

One performance area does appear to have seen an improvement. The transport gives a much improved standard of speed stability. The numbers are extremely fine for a deck at this price level, and the spectrum analysis could have been produced by one of the better decks at double the price.

Each of the three test tapes used to assess the record/replay frequency responses uncovered slightly bright tonal balances at the normal, central setting of the fine bias control. The error is relatively small and caused by incorrect equalisation, the peak amplitude being a worst case 1dB at the extreme HF. Dolby record/replay integrity is fair, and the replay only response demonstrates plenty of wideband energy, but a sharply elevated top end, peaking to +3.5dB near 18kHz.

SOUND QUALITY

There are several good cassette decks in this price area, but the *DRM-500* goes one step further than most. It's a little special. Recording and playing back some energetic and atmospherically recorded Shostakovich I was more than a little surprised to find that the Denon had the measure of the powerful string opening passage, and of the grotesquely energetic waltz rhythms that ensue. It's not unusual to find that this kind of dense, energetic music making is reduced in the processing of recording, but the *500*'s intrinsic abilities pulled it through.

One of the key reasons for this good showing is undoubtedly the excellence of the bass, which is unusually full and alive. It has real power and range given the right kind of material to practise on, where much of the competition falls into the trap of sounding vaguely mushy and defocused.

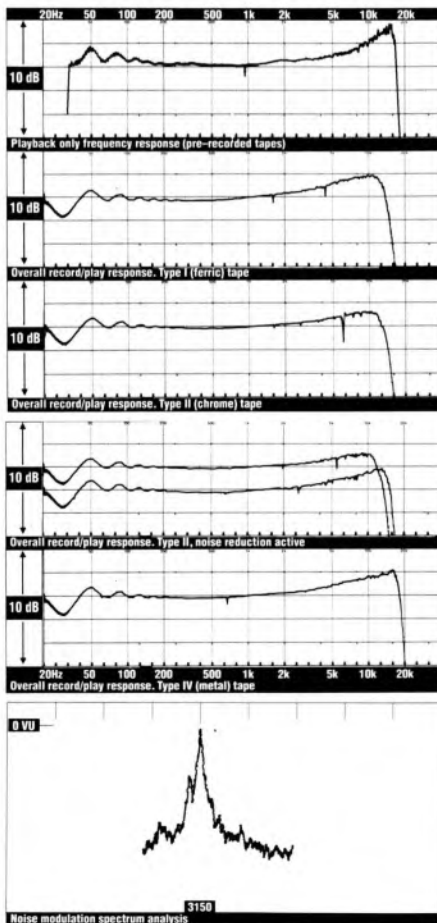
The *DRM-500* is good elsewhere too. Overall it is detailed and extremely stable sounding, no doubt partly due to the excellence of the transport. There was a suggestion of high frequency coarseness, and HF background noise sounded slightly more prominent and 'flickery' in character than I expected (a noisy resistor maybe?), but these things barely detracted from the overall level of ability. The Denon didn't disappoint with prerecorded material either where it rarely sounded less than lean and powerful.

CONCLUSIONS

This smart new addition to the Denon line has no trouble seeing off most of the direct competition, including its own predecessor. It's well equipped and offers a powerful, stable and engaging style of music making, despite a small question mark over treble quality. The only point that would make me think twice is the absence of a timer standby feature, a silly omission that ought to be put right in the Mark II modification programme, if and when. Even so, this is clear Best Buy material.

TEST RESULTS

Dolby Level (on cassette deck meters)	-3dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	<20Hz - 15kHz
IEC Type II	<20Hz - 15kHz
IEC Type IV	<20Hz - 19kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.08%/0.13%
Wow/Flutter Peak DIN wtd	0.07%/0.1%
Speed error	-0.02%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.7%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.5%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.6%
Channel separation 0VU/1kHz	70dB
Line input sensitivity/overload	97mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	880mV/2.75V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.63%
Azimuth check R-L phase at 10kHz	60°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	43.5 x 12.5 x 27.5cms
Typical retail price inc VAT	£169.95



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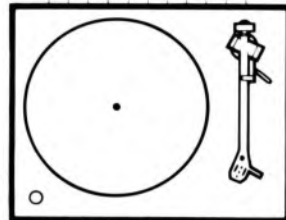
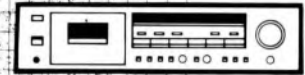
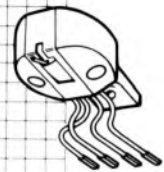
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DENON DRM-800

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RECOMMENDED



Denon is in the process of introducing a new range of cassette decks, the *DRM-800* slotting in near the top of the range providing a case study of how cassette decks have developed as a direct result (it seems) of the hiatus in the development of DAT.

Central to any cassette deck are the transport and heads. The *800* transport has three separate motors and dual capstans to maintain a constant tension across the heads, irrespective of how much tape has been wound off the feed reel. It's controlled by a slick cam operated mechanism which, although not as silent as the manufacturer claims, is pretty quiet by normal standards. The tape is held in an illuminated bay by a door that incorporates an effective clamping system. There are three heads, the design being developed for real time off-tape monitoring. In common with other recent decks of this type, tape/source monitoring is automatic, though you can override the selection to make comparisons.

Unfortunately the *DRM-800* doesn't have a sensitivity control for tape level matching purposes, but there is a bias control pot, the tape/source switching facility making accurate line-up relatively easy. There's an output level control in line with the headphone circuit and also in the line feed, which is a mistake I feel because it introduces an unnecessary series potentiometer, with an inevitably small degrading effect on the sound.

Amongst the convenience features offered, there's a real time tape counter (but you have to zero it manually) with various memory features associated, plus track search, audible cueing, record return, Dolby B and C (with switchable MPX filter) and Dolby HX Pro. An additional line input is provided, labelled CD direct. The newly designed display is very clear and comprehensive, and includes excellent 50dB high resolution record level meters. There's one major omission too, as the Denon is not timer compatible.

LAB REPORT

The basic record/replay plots – run with the bias pot centred – are satisfactory, with excellent treble extension with Type IV tape and a well optimised bass in all cases with virtually no sign of the usual contour effects.

However, the two Dolby traces show clear if mild signs of mistracking, and although the effect isn't large, it's surely significant in this class of recorder. There's also a notable azimuth error (45 degrees between channels at 10kHz), and the playback only response shape is rather saucer-like – though the overall response is still containable within a ± 1 dB envelope across the band.

There's no gainsaying the superb quality of the transport, which gave excellent figures on test however it was measured, plus a textbook spectrum analysis plot. Noise and harmonic distortion figures are all more than satisfactory and the record and playback amps have plenty of headroom.

SOUND QUALITY

In common with the other three head decks, the *800* was auditioned using the tape monitor switch on the partnering amplifier to compare pre and post-tape sound quality rather than the tape/source switch on the cassette deck, which can prove misleading and is not representative of real life use. I also auditioned recordings after they had been rewound and replayed, not in real life.

With prerecorded tapes, a certain amount of added warmth was noticed – the measured frequency response shows why – but of much greater interest was the excellent midband and clean HF. The mid is open sounding and airy, and there's a real feeling of presence along with high levels of detail.

Where the Denon really excels however is when making its own recordings. One immediately noticeable feature is that the Dolby HX Pro circuits are more effective than usual. The *800* goes a long way to providing a Type IV/metal standard of precision and liveliness even with Type I tapes, and although metals are the optimum choice where quality is of the essence, the gap is narrower than usual for the right reasons – ferrics and chromes are levelled up rather than metal recordings being levelled down. In all cases the deck offers great clarity and insight. Stereo imagery is excellent, with clear central focus and ambient detail reproduction. There was a small but significant advantage in using the CD direct input.

CONCLUSIONS

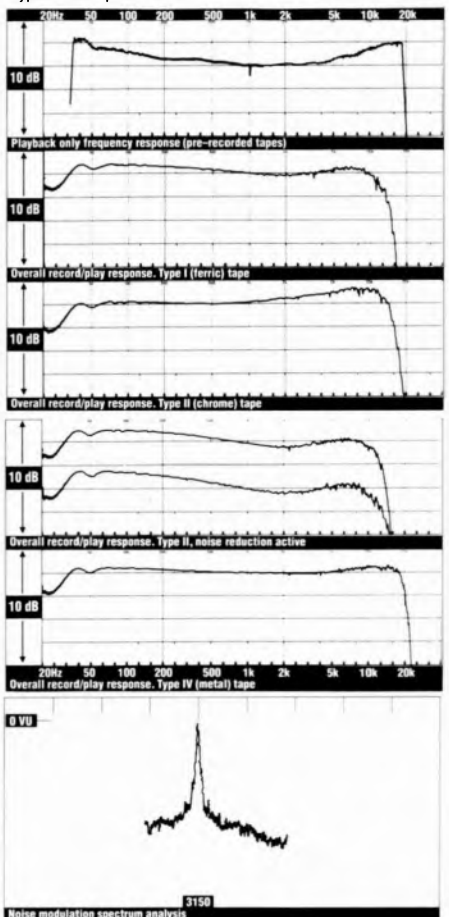
The absence of a timer standby facility is a

potentially major omission from a deck so otherwise well equipped. I also regret the omission of a sensitivity control, especially as there were signs of Dolby mistracking due to a replay level mismatch with Type II tape stock.

On the other hand, the audio circuits are clean and the transport is exceptionally stable, with the result that most of the faults that mark out cassettes from other sources – the subtle losses of focus, stereo soundstaging, bass definition and low level resolution – are either ameliorated or banished. Strongly Recommended.

TEST RESULTS

Dolby Level (on cassette deck meters)	+1dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	20Hz – 15kHz
IEC Type II	20Hz – 17kHz
IEC Type IV	20Hz – 21kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.05%/0.08%
Wow/Flutter Peak DIN wtd	0.03%/0.06%
Speed error	-0.1%
Type I signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.6%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	0.8%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.7%
Channel separation DVU/1kHz	67dB
Line input sensitivity/overload	CD direct – 125/Std 94mV/8.8V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	700mV/1.74V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	0.9%
Azimuth check R-L phase at 10kHz	45°
VU indication at IEC 0dB	+2dB
Dimensions (w x h x d)	43.5 x 13.5 x 30.5cm
Typical retail price inc VAT	£299



KENWOOD KX-3010

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



The 3010 is one of those decks with a clickety-clack transport – a technical term meaning that the transport goes clickety-clack when operated! Key features include a single capstan, unidirectional transport and two heads, Dolby B, C and Dolby HX Pro. The KX-3010 additionally offers a number of new features over its KX-660HX predecessor. The 660's bias adjustment pot is replaced by a more sophisticated addition – a particularly welcome one with a two head cassette deck where source/tape comparisons are necessarily somewhat indirect – an auto bias circuit. Effective with all three tape groups, it works by winding the tape past its leader, adjusting bias using 400Hz and 10kHz tones and rewinding to the start, ready to record – a simple one-button, no hassle operation. The display area is also improved, with high resolution two colour peak hold meters with a wide 40dB range. It also has a cassette shell stabiliser.

What's left? The list includes a fixed level headphone socket, index (intro) scan, blank search, a real time tape counter with memory stop, repeat play of individual tracks or complete tape sides, return to the record start point and more. One criticism is that several of these features require obscure and mostly unflagged transport key sequences to make them work. You just have to study the instructions until you get them off pat.

LAB REPORT

As you can tell from the frequency response plots, the Kenwood 3010 is a deck whose head geometry is well optimised and which suffers far fewer LF perturbations than usual, especially at its price. Run after optimising the test tapes using the auto-bias facility, the basic Type I, II and IV responses are almost ruler flat, but the Dolby circuits are poorly lined up with the result that with Dolby C the region above 10kHz suffers a High Q resonant peak and the LF end is well adrift, with an output peak around 300Hz. The Dolby B response shape is much closer to accurate. Prerecorded tapes are not very well accommodated either, output suffering a fairly sharp fall above 2kHz largely it seems due to a replay head azimuth error.

Wow and flutter is reasonable numerically for the price, the spectrum analysis showing a fairly typical pattern of moderately high

level wow products which occasionally were audible under exacting conditions. Other measurements show some mild asymmetry between channels (the figure shown for Dolby level for example is the average as the channels differed by 1dB), but the various signal/noise results are respectable and the electronics have plenty of high level headroom.

SOUND QUALITY

The 3010 ought to appeal to a wide cross section of users whose requirements embrace good quality within a reasonable price frame. Recordings (of CDs and of records) made on the Kenwood were pretty good on the whole. There were some of the expected shortcomings – a certain splashiness and defocusing of the sound, especially at high frequencies, particularly noticeable with wind instruments, brass, percussion and the like. Flutter components may play their part here, but additionally the deck's electronics are probably not the most sophisticated in their class, and can sound a touch tight and dry, with the result that music often comes over as rather lacking in the quality of grace. Come to think of it, perhaps the Kenwood is electrically sophisticated, and that's why it sounds the way it does.

Dolby B works very well, but Dolby C recordings tend to sound thick and heavy, especially when the deck is driven hard. In its favour, the bass sounds extended and surprisingly pure.

Prerecorded tapes suffer at the hands of the 3010, sounding variously dull, lifeless and dynamically, even spatially flat depending on which part of my listening notes I raided for adjectives.

I did not form any strong overall preference for any particular species of tape. Metal recordings had better HF headroom, but the 3010 didn't appear at its best when stressed in this way for the reasons already given. This said, the deck is clean, sharp and very detailed, and under most conditions it sounds both neutral and dynamic.

CONCLUSIONS

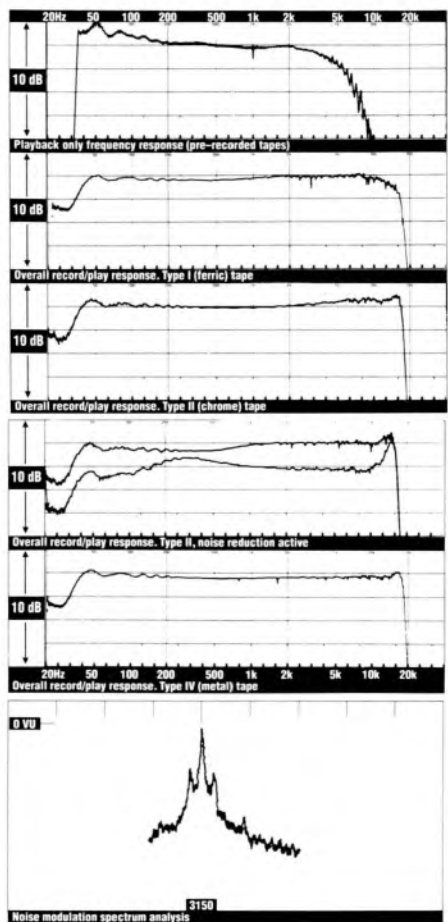
Kenwood cassette decks have proved consistently, er, average over the last few years, often scoring in value terms more than in absolute standards of performance. And this

is the case here. Weaknesses include a clumsy implementation of some of the minor features, and sound quality which is at once sharp and well extended but a touch synthetic, especially with Dolby C.

The strengths and weaknesses of this player are not dissimilar to those of the dearer 9010, but criticism is much muted here because of the cost difference. At the price this is a pretty fair deck and would certainly have been good enough to warrant formal recommendation if the azimuth error and consequent poor sound quality with pre-recorded cassettes hadn't been a factor.

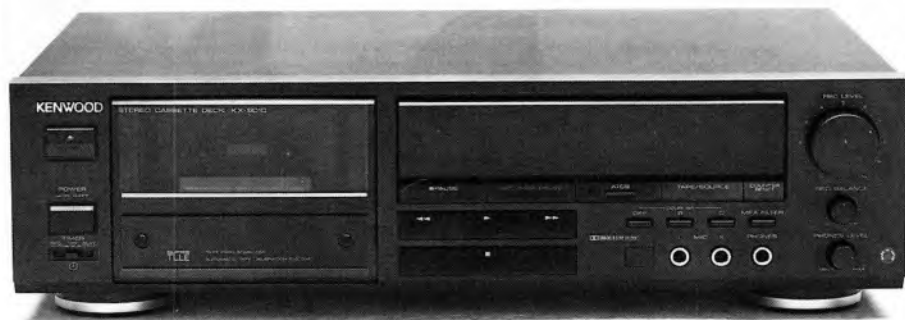
TEST RESULTS

Dolby Level (on cassette deck meters)	+0.50B
Rec/replay response – 3dB ref 1kHz	
IEC Type I	20Hz – 17kHz
IEC Type II	20Hz – 18kHz
IEC Type IV	20Hz – 19kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.09%/0.15%
Wow/Flutter Peak DIN wtd	0.075%/0.15%
Speed error	+0.02%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.9%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	1.1%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.6%
Channel separation DVU/1kHz	50dB
Line input sensitivity/overload	130mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	800mV/3.7V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.0%
Azimuth check R-L phase at 10kHz	90°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	44 x 12.5 x 32cms
Typical retail price inc VAT	£169.95



KENWOOD KX-9010

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



I was intrigued to read in the *KX-9010*'s technical bulletin that the market for more costly cassette decks is growing by virtue of the failure of DAT 'like what happened in the market of analogue disc players and that of compact disc players' (sic). Kenwood clearly believes, and I'm sure correctly, that where once the public had been expected to buy DAT and prerecorded digital tapes, they've actually turned back to cassettes which are being used to dub from 'perfect' compact discs. This is precisely the opposite of the software industry's predictions during its historic (and in retrospect spectacularly successful) scare campaign against DAT. Ironic, innit?

The Dolby B/C/HX-Pro *KX-9010* is a very sophisticated engine for transferring CDs on to tape, though unlike many it will also record directly from microphones. On paper at least it has all the attributes of a top class machine. Naturally it has three heads with automatically switched off tape monitoring, with the single oddity that tape monitor remains selected when 'stop' is pressed, although the tape/source monitor switching can be overridden as required.

The transport is a dual capstan design which with other measures gives very good tape isolation and very fine speed stability between the capstans. Additionally the *9010* is blessed with a fully automatic tape set-up routine. Called ATCS, (Automatic Tape Calibration System) it adjusts record bias and sensitivity which in principle means a flat frequency response and no Dolby mis-tracking, whatever type of tape is used.

Considerable efforts have been taken to ensure physical and electrical integrity, including fitting a cassette stabiliser. Electrical measures take in the power supply, grounding, general circuit topology like impedances, length of signal runs and other hard to quantify aspects of the kind, whilst a number of simple anti-resonance measures are taken in the design of the transport, the structure of the player, the isolating feet etc.

The deck has wide-ranging (42dB) peak reading meters, a real time counter, switchable MPX and a headphone volume control. Last but not least, it comes complete with a small infra-red handset with basic controls for the transport functions, record, ATCS, tape counter reset and tape/source monitor-

ing. The only complaint is that the control buttons are rather small and closely packed. Search aids - none too clearly implemented - include a counter memory, return to record start, auto rewind and play and full side repeat. I was surprised to find that there is no track search feature of any kind.

LAB REPORT

The *9010* is blessed with a superb transport that produces the kind of numbers, and spectrum analysis plots, that would look quite at home in a professional open reel tape recorder. There's a trace of a low level artefact, probably caused by residual capstan wow.

The electronics are wide ranging. High level IM distortion is very low, and the electronics have bags of headroom over the nominal 0VU. Signal/noise is good too. Most of the frequency responses are dead flat, and those that aren't don't wander far from the straight and narrow, though the Type I ferric result is bumped up a couple of dB at 15kHz (it's only 1dB up at the 10kHz measuring point). The plots were made after the tapes had been processed by ATCS. The deck was also tested at its standard (default) settings with results that were nothing like as good.

SOUND QUALITY

And now we come to one of those curious, hard to explain paradoxes that help make high fidelity the perpetually surprising pursuit it is. For in the *9010* we have a cassette deck which has everything you could possibly wish for (except track search) and which sails through the measurement programme as though charmed. Although the deck has a superficially very clean and sharp sound, in reality the electronics are far from transparent. The effect is rather tight and dry, with constrained dynamics.

Despite Dolby HX Pro, even Type II recordings (eg TDK SA) sound curiously uneven with muddled dynamics, and Dolby noise reduction merely adds to the problems, though Dolby B at least is necessary simply to achieve reasonable hiss levels. Metal tapes suit the deck best, but even here there is a kind of flatness to the sound; an inability to 'breathe' and reproduce a subtle acoustic coherently. At the same time, credit must be given for the very clean, extended and remarkably un-waffly bass and the near ideal

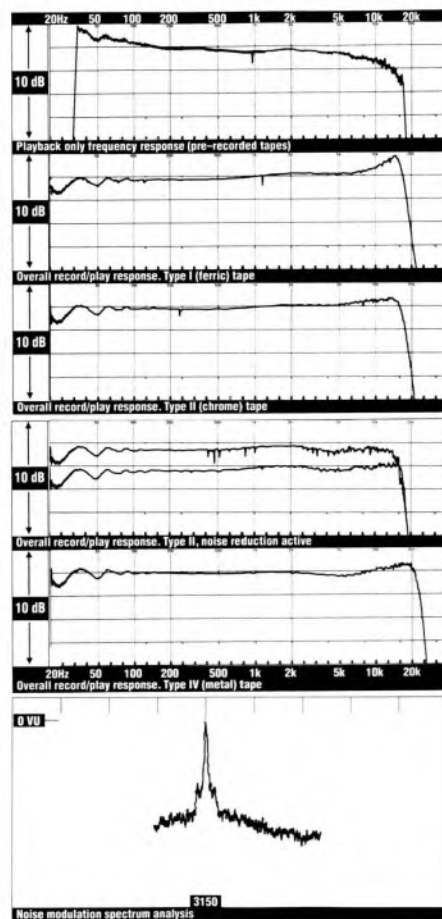
lack of audible speed instability in any form.

CONCLUSIONS

I don't wish to overstate the case against. This deck has a lot going for it, and it offers the kind of diamond polished sharpness that transcends the usual stereotype used to describe cassette sound. In a slightly cheaper package it would be counted a very talented box of electronics, but at £400, given the lack of musical empathy demonstrated on test, a stricter view is justified.

TEST RESULTS

Dolby Level (on cassette deck meters)	+1dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	<20Hz - 18kHz
IEC Type II	<20Hz - 18kHz
IEC Type IV	<20Hz - 23kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.025%/0.07%
Wow/Flutter Peak DIN wtd	0.06%/0.06%
Speed error	+0.01%
Type I signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	-56dB
distortion 0dB	1.4%
Type IV signal/noise CCIR/ARM 400Hz	-51dB
distortion 0dB	0.7%
Channel separation 0VU/1kHz	-75dB
Line input sensitivity/overload	106mV/10.25V
Mic input sensitivity/overload	0.5mV/45mV
Line output for 0dB/maximum	782mV/4.9V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	1.0%
Azimuth check R-L phase at 10kHz	90°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	44 x 12.5 x 32cms
Typical retail price inc VAT	£399.95





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RECOMMENDED



In common with its more expensive counterparts, the *CT-656* is a three head design with off tape monitoring, switchable dual range (28dB/15dB) record level meters, Dolby B, C and HX Pro - even switchable MPX filtering and a real time tape counter based on the *CT-737* pattern. To assist with setting record levels, the peak hold LEDs can be held on indefinitely, being defeated only by a subsequent higher level peak. The headphone monitoring loop includes a volume control.

However, close examination shows many differences, both major and minor. A look around the cassette loading area provides a clue to how the cost cutting has been achieved. Although the loading mechanism still employs rudimentary cassette shell damping, the door is not removable which makes head cleaning and demagnetising a little more awkward. The cassette well is not illuminated, the eject feature is mechanical and not linked in with the transport logic, so stop has to be pressed before eject.

In other areas I noticed details like the lower grade transport with its noisier solenoid transport engagement and the slightly cruder (but still not unsophisticated) record level meters. The common factor that links these and the other differences not detailed is that from the user's point of view, they hardly matter. The deck remains almost extravagantly equipped for the price. The most important missing feature is an adjustment for record sensitivity, which rules out certain very sensitive tapes that will cause Dolby mistracking. All normal tapes remain satisfactory. A fine bias adjuster is still part of the package.

Like its more expensive counterparts, the *CT-656* has a low resonance structural design (look for example at the honeycomb base structure), direct coupled, PC-OCC wired heads, a diecast head base, minimum length signal paths and a relatively elaborate power supply design. The deck is neatly laid out and also very logically designed so the learning curve should be a short one.

LAB REPORT

There's a curious similarity between the measurements for this deck and other Pioneer models. There's something of a rising response trend with Type II tapes, which is the reason for the lack of Dolby linearity.

There don't appear to be any serious intrinsic Dolby line-up problems, and the playback only response rises significantly in the highest couple of octaves. However, the other responses are extremely accurate, and head contour effects are controlled, albeit not as effectively as with the *CT-737*. Speed stability also falls short of that model, though a weighted 0.06 per cent for the record/playback cycle is hardly to be sniffed at. The spectrum analysis, whilst showing the increased energy off the main spectral line, is broadly similar to the *CT-737*.

Other figures mostly are interchangeable with those of the senior model, and if this doesn't mean anything else, it certainly does mean that we're looking at a deck which measures extremely well for a low end three head cassette deck.

SOUND QUALITY

Playback of prerecorded material sounds fuller in the midband and weightier than with the *CT-737* for example, and is generally more acceptable overall, though some of the high-end liveliness of the dearer model is traded in the cause of relative neutrality. As always with this deck, there is never any doubt about speed stability.

The *656* is blessed with more than respectably transparent sounding electronics even leaving the tape record and playback process to one side. When recording too, sound quality was well on the way to emulating the potential of the source material itself.

Of course accuracy is a relative term, it is never absolute. The *CT-656* has a tendency to simplify the information it's fed, the bass especially leaning in the direction of blandness. The midband sounds smooth and detailed, though a touch compressed by the best standards. On the whole though the deck avoids the worst traps of the breed, and with a good metal tape and Dolby B as an optimum compromise between noise reduction and intrusion caused by the noise reduction circuits, the deck sounds little worse than the considerably more expensive *CT-737*.

Our test deck sounded a little detached with lower bias tapes, and compression levels tended to be greater too. Recordings made on ferric stock were invariably rather mild man-

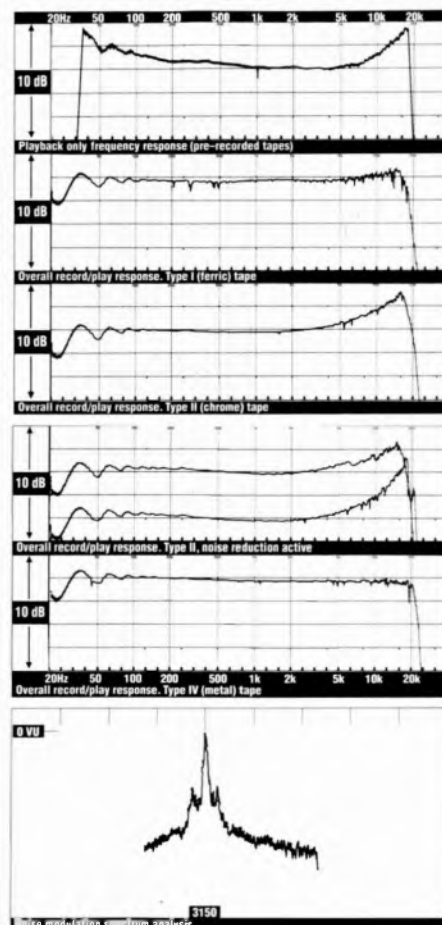
nered when compared to equivalent metal tape recordings.

CONCLUSIONS

I liked this deck. It lacks many of the more glamorous accoutrements of the dearer Pioneer models, but functional losses are small, and the deck is consequently excellent value for money. Although by no means a state of the art product, the *CT-656* is a distinguished entrant in the market for budget three head designs. It can be confidently Recommended.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	20Hz - 19kHz
IEC Type II	20Hz - 20kHz
IEC Type IV	20Hz - 25kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.06%/0.10%
Wow/Flutter Peak DIN wtd	0.05%/0.08%
Speed error	+0.05%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.6%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.8%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.5%
Channel separation 0VU/1kHz	
Line input sensitivity/overload	86mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	500mV/2.4V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.28%
Azimuth check R-L phase at 10kHz	20°
VU indication at IEC 0dB	+0.4dB
Dimensions (w x h x d)	42 x 13 x 32.5cms
Typical retail price inc VAT	£249.90



PIONEER CT-737 Mk II

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



In common with its *CT-737* predecessor, the *CT-737 Mk II* is a three head, unidirectional model whose brief is said to include digital compatibility, whatever that may mean. Changes have been made to the transport mechanism, to the playback amplifiers and in the addition of a rudimentary but useful tape calibration system covering record bias and sensitivity.

The transport improvements are significant, and include a newly designed flywheel with a higher moment of inertia, and changes to the back tension across the heads, designed to reduce wow and supply side flutter and resonance to a level which Pioneer says is pretty well as good as can be achieved without resorting to dual capstans. Coupling capacitors have been removed from the playback circuit and head contour effects have been reduced. The bias and level (sensitivity) adjustments are manual; ideally you should make the adjustments using something like interstation FM hiss.

Dolby HX Pro is available in addition to Dolby B and C; MPX filtering is switchable. From the convenience angle the deck is well equipped without going to excess. For example, tape/source monitoring is automatic with a manual override; the electronic tape counter has an optional time mode (with manual zeroing) and a track search feature can be programmed to locate up to 15 tracks in either direction, or the start of the current recording. Headphone monitoring levels are adjustable. The record level meters are a particular joy, and can even be switched to read from -35 to +12dB or from -4 to +16dB, with the tape type maximum explicitly picked out with red LEDs. The meters are peak holding and fully lit.

This is a well made recorder with notably successful ergonomics and a very sweet acting transport. A particularly attractive feature is a powered door which can be opened direct from play or fast wind (though not from record mode of course) and closes automatically if play or fast wind - or even record - is selected.

LAB REPORT

Head contour effects are not as well controlled as with the *CT-91a*, but they're low and the bass response is well extended and flat. However, most of the tapes show a distinct

rising response trend at HF - Type IV metal is the obvious exception, and the Type I tape is only mildly in error. Type II IEC tape was significantly underbiased and careful tweaking of both level and bias was needed to match the Type IIs I tried to the recorder. If the matching was done correctly, most of the apparent Dolby misalignment disappeared, though there was a residual shift in spectral balance through the midband and Dolby had other effects, detailed later. The 'U' shaped replay response however, was not open to correction. One good point: the poor tape/head contact experienced with the original *737* was absent here.

Signal/noise performance precisely parallels the more expensive Pioneer, but distortion products rise significantly faster at the loud end of the dynamic range. High level IM distortion is also higher (though still low in absolute terms) which is a litmus test of the way the electronics are beginning to close down at these levels. The transport too gave good figures but not as good as the flagship model, with wow artefacts clearly visible in the spectrum analysis plot.

SOUND QUALITY

As a recorder the *CT-737* is a greatly improved product. The old roughness and lack of stability has been banished effectively and what's left is clear and articulate. However, the market as a whole has moved on, and whilst a couple of years ago it would have proved exceptional, it all looks (or rather sounds) a little mundane now. Exactly why isn't easy to pin down, but there's a lack of sparkle with this deck.

Imagery is firm and stable laterally, but the depth dimension scarcely gets a look in, and the bass, whilst good by cassette standards, stands so far downwind of the *CT-91a* that they might as well come from different planets. Compression sets in when the deck is driven hard at high levels, and it's necessary to exercise some restraint with the input level control especially if the source material is rich in high frequency content. Dolby processing also does its bit to sap life from the music, especially in the case of Dolby C.

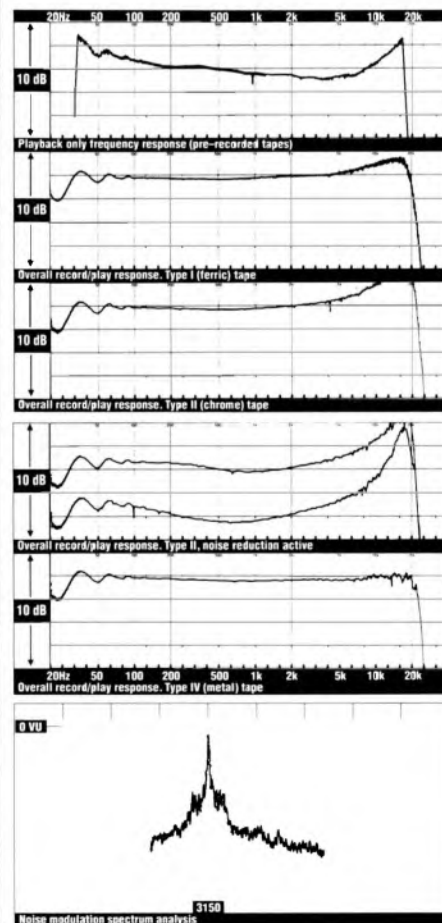
It was not possible to achieve an accurate replay only response. My test tapes sounded sharp and a little thin, though brilliantly coloured and highly articulate.

CONCLUSIONS

This model is a borderline case for recommendation. It never sounds less than competent, and is strong in the areas where cassette is often weak - for example speed stability. In the end however, it must be marked down partly due to rapidly improving standards elsewhere, but mostly because of a fundamental miscalculation. To whit, and to a first approximation, the *CT-737* has much of the *CT-91a*'s packaging and the sound of the cheaper *CT-656*. It should be the other way around.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	<20Hz - 21kHz
IEC Type II	<20Hz - 21kHz
IEC Type IV	<20Hz - 21kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.5%/0.09%
Wow/Flutter Peak DIN wtd	0.05%/0.09%
Speed error	+0.04%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	0.85%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.55%
Channel separation 0VU/1 kHz	68dB
Line input sensitivity/overload	89mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	513mV/2.4V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.8%
Azimuth check R-L phase at 10kHz	20°
VU indication at IEC 0dB	+4dB
Dimensions (w x h x d)	42 x 13.5 x 37.5cms
Typical retail price inc VAT	£349.90



PIONEER CT-91a

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

RECOMMENDED



Technics used to have a thing about the number seven. Until the company came unstuck with an outstandingly average CD player, it had a run of 'classic' models with the number in the title. Pioneer is intent on repeating the trick with the unlikely number 91. Its CD player came first – a real humdinger – and there's a truly excellent tuner too, and this is the third product in the line. The *CT-91a* is far from being a cost no object cassette deck, but it remains an expensive one with an emphasis on the fundamental engineering and electronic properties rather than gadgets aimed to tempt 'casual' buyers.

Those familiar with the Pioneer range will notice a more than superficial resemblance between this deck and the *CT-737*, which costs £150 less. The key visual difference is the much upgraded exterior design, chiefly the mirror finish black fascia and the deep piano gloss wood side cheeks and little bits of gold trim. The effect is undeniably sumptuous, and in my view only just in good taste. There's also an extra switch which is used to tell the deck the cassette playing time. This signals the presence of an intelligent real time tape counter.

However, the other features are identical to the *CT-737*, and I refer readers to that review for full details. In brief, this is a full three-head unidirectional deck with automatically controlled off-tape monitoring. Tape bias and sensitivity can be set manually – you calibrate it by matching the source and off tape feeds – and Dolby B, C and HX Pro are included. The meters are unusually sophisticated and wide ranging and other displays included are to a similarly high standard. Tape search aids include track search for up to 15 tracks forwards or back. Headphone volume level is controllable.

Under the skin, the *CT-91a* is a very sophisticated design. The *CT-737*'s single capstan transport is replaced here by a very classy dual capstan staggered resonance transport (sympathetic resonances are systematically weeded out by varying the sizes and therefore resonances of the various transport components). The PC-OCC wired heads are mounted on a diecast zinc head block. Circuit topology is designed for the shortest possible signal paths. The power supply section is massively built, and the physical construction of the player employs

low resonance techniques and a low magnetic content.

LAB REPORT

The picture the measurements suggests is of a high grade product offering wide, mostly accurate frequency responses, low distortion levels even under conditions that would cause other decks to run into overload, and a meticulously engineered and very stable running transport. However, the playback only response shape is bright, rising strongly above 5kHz, and the uncorrected Type II responses are also rather toppy, suggesting that the deck is nominally adjusted for tapes with a slightly higher bias requirement. However, this can be tuned out using the adjustable bias facility, leaving an intrinsically flat response. Note the almost complete absence of head contour effects.

Wow and flutter is exceptionally low, which is confirmed by the ultra-clean spectrum analysis. The *91a* can lay very high levels on to tape extremely cleanly, the high-end intermodulation tests indicating electronics with plenty of useful headroom in hand.

SOUND QUALITY

The beauty of this deck is that the advantage it shows over the similar *CT-737* is far from small when it comes to playing music. This is not to demean the latter which is a fine machine as the review makes clear. But the *CT-91a* is special – it clearly has greater powers of separation, with individual instruments in a 'frame' enjoying greater independence, more expressiveness and greater clarity. Nowhere are these advantages more apparent than in the bass region which has a range of qualities that emulate the quality of the source used for making the recordings extremely closely. Many people will be surprised that it is a cassette based machine at all, so nearly is it in danger of transcending the natural limitations, and so authoritative is its style of delivery.

Optimum performance is achieved with metal tapes as usual, and Dolby processing does relatively little to spoil things whilst contributing its usual highly effective quota of hiss banishment. There is a mild tendency to metallic coloration at high levels, especially with Dolby C in charge. At the same time, whilst lower bias tapes sound soft and

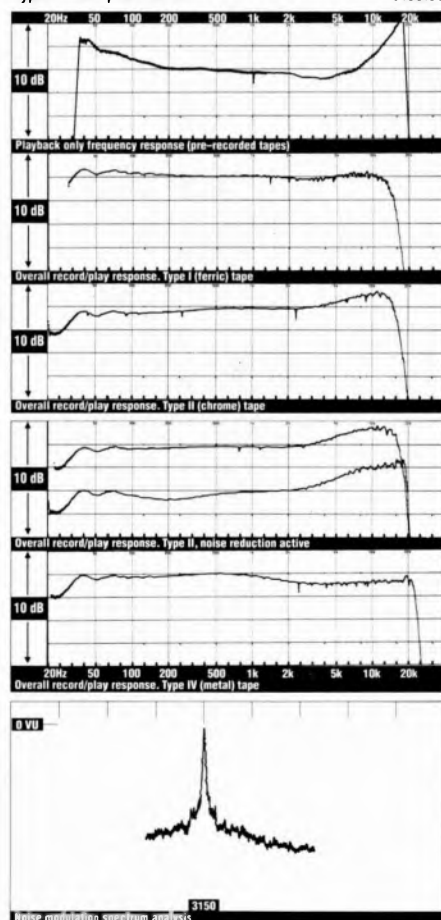
fluffy compared to metals (HX Pro notwithstanding), it does more to make such tapes sound dynamic and sharply focused than most. Finally, the *CT-91a* is remarkably capable of transferring high levels on to and off tape without squash.

CONCLUSIONS

Quite simply, this is a brilliant cassette deck, well worth every last cent of its £500-ish asking price. Fine under-the-skin engineering and glossy Japanese home market good looks pay off spectacularly in this talented and purposeful design.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	20Hz – 18kHz
IEC Type II	20Hz – 18kHz
IEC Type IV	20Hz – 22kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.04%/0.06%
Wow/Flutter Peak DIN wtd	0.03%/0.05%
Speed error	+0.05%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	32.5%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	0.4%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.5%
Channel separation 0VU/1kHz	65dB
Line input sensitivity/overload	90mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	510mV/4.65V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.14%
Azimuth check R-L phase at 10kHz	5°
VU indication at IEC 0dB	+4dB
Dimensions (w x h x d)	46 x 13.5 x 37.5cms
Typical retail price inc VAT	£499.90



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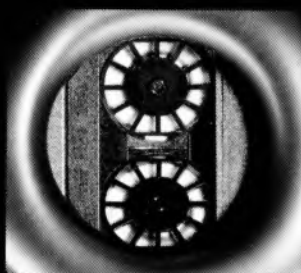
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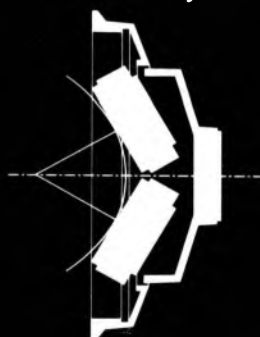


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REVOX B215-S

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

RECOMMENDED



The three-head, twin capstan Revox *B215-S* inhabits an area of the market where only Nakamichi and a select few others belong. We covered the machine once before (way back in Issue 52) but market conditions have changed and, well, a reassessment seemed in order. In case an extra excuse was needed, there have been minor circuit changes, and some more radical aesthetic ones.

By any standard this is a sophisticated deck. The classy transport (see Lab Report) is logic controlled and mode engagement happens in an almost unearthly hush. 'Punch in' recording is supported, as is a high speed 'inching' mode. The built in logic will even skip the leader on rewind, or perform a record return.

The audio circuits are well endowed too, with clear evidence that the design is made as easy as possible to use, but with all automatic features overridable if possible to maximise flexibility. Key inclusions are Dolby B, C and HX Pro – the latter completely unannounced. There's a fully automatic tape calibration system for bias and sensitivity, the settings being stored in one of two Type I, two Type IV, or one Type IV memory positions. Even the tape type recognition is unusual as the deck's selection can be overridden to allow 120µS Type II recording.

Status information is provided by a pair of unpreprocessing lack-lit liquid crystal displays. The meters are short, high resolution types with a 38dB range, and the counter is a real time device which automatically computes the amount of tape that has elapsed. Two tape locations defined by time data can be addressed directly. Revox even helps when adjusting record levels, using a kind of servo circuit which relates the record level setting to the input it receives as long as the 'Set Level' button is held down. Finally, an optional system remote control, capable of controlling one or two *B215s*, is available for \$88. Revox's receiver is fitted and ready.

LAB REPORT

It's worth noting that the Revox is as solid as a rock, and beautifully built inside. The outside appearance is enhanced in the current version by the new black and gold livery and the deep gloss wood side cheeks. At its heart, mounted amidstships, it has a magnificent three head, dual capstan transport which

lacks the usual loading door in favour of a direct clip-in arrangement. A snap-on cover is supplied. The transport boasts no less than four power plants – two reel motors plus a direct drive motor for each capstan. The level of measured wow is almost imperceptibly small, and although the flutter figure is less impressive, it's still low.

Measured deficiencies are very few, though not quite insignificant. In particular, the line input and output overload is at an unusually low level, whilst at the opposite end of the dynamic range, hum wasn't entirely absent, though it was generally masked by music. However, in the normal tape operating region the decks offers low (though not state of the art) distortion and noise levels.

The tape calibration system proved remarkably consistent between runs, and also between tape groups, in each case producing an output curve similar to the replay only response – flat through the bass and mid (note the absence of contour effects) and elevated a couple of dB in the last octave.

SOUND QUALITY

Sound quality is excellent, going a long way towards justifying the price. The Revox has a very fine, controlled style of music reproduction with excellent stereo imagery that mimics the source well, even to the extent of producing a realistic stereo image at the frequency extremes (bass especially) where cassette decks are generally weakest. The bass sounds solid, tuneful and quick, and the deck is capable of consistently powerful well differentiated dynamics. On the other hand the resolution of fine detail isn't quite Nakamichi class.

The *B215-S* is a deck that gains considerably from the use of high bias tapes generally, and metal tapes in particular. Dolby HX Pro undoubtedly helps with lower bias tapes, but ferrics especially simply don't have the precision and 'balls' of a good metal. Dolby noise reduction also detracted somewhat from the sense of presence and energy, a comment that is particularly true of Dolby C. Finally, prerecorded tapes sound unusually open and stable.

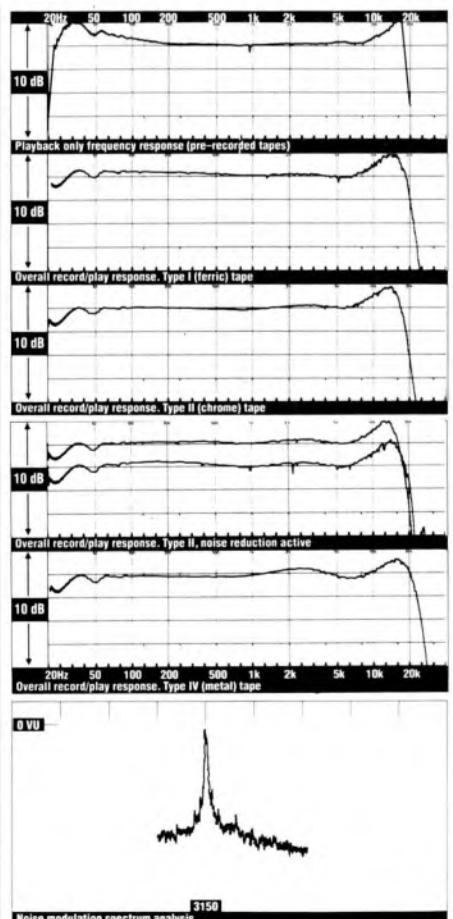
CONCLUSIONS

Recommended, obviously. The Revox is good

enough to stress certain aspects of the cassette system itself, not least the dynamic qualities of non-metal tapes and the performance of the Dolby circuitry. Even with Dolby C, however, the deck sounds clean and assured, with particularly good stereo imagery and bass integrity – both areas where cassettes normally flunk out. I am unconvinced by the deck's ergonomics, while value for money, assessed strictly by performance achieved, remains slightly suspect. Still, you know what they say. Pay peanuts and you get monkeys . . .

TEST RESULTS

Dolby Level (on cassette deck meters)	-10dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	<20Hz - 21kHz
IEC Type II	<20Hz - 20kHz
IEC Type IV	<20Hz - 22kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.03%/0.08%
Wow/Flutter Peak DIN wtd	0.02%/0.07%
Speed error	+0.05%
Type I signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.75%
Type II signal/noise CCIR/ARM 400Hz	55dB
distortion 0dB	0.8%
Type IV signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.75%
Channel separation 0VU/1kHz	74dB
Line input sensitivity/overload	58mW/2.25V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	930mV/5.0V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	0.71%
Azimuth check R-L phase at 10kHz	0°
VU indication at IEC 0dB	+2dB
Dimensions (w x h x d)	45 x 15.5 x 33.5cms
Typical retail price inc VAT	£1.481



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ROTEL RD-865

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

BEST BUY



The RD-865 will be welcomed by many, including of course those who already own Rotel electronics, or who aspire to a simple deck but are willing to pay a little over the odds for a model engineered to slightly more purist ideals. That at least would be a reasonable supposition based on past form and a quick examination of the RD-865 itself.

There are relatively few concessions to luxury. The cassette well, for example, is not illuminated, nor does it include disc clamping, though the cassette door does unclip for cleaning. The transport controls are stretched in a long row, and instruct the transport itself via unduly noisy solenoids. Extra transport facilities included over and above the bare minimum cover next/last track search and memory stop (courtesy of an electronic tape counter). A repeat key is also incorporated which will repeat complete sides, or between any arbitrary point (marked with the counter reset key) and the end of the tape. Dolby B and C are supplemented by an MPX filter switch and Dolby HX Pro. The Rotel also has a bias control. The recording level meters offer high resolution and a reasonable 28dB range in two colours but without peak hold.

There are some notable omissions too. Remarkably there's no headphone socket, though that shouldn't bother those intending using the deck exclusively as part of a normal hi-fi system. There's no timer standby feature either which means you can't use it to make unattended recordings. The display area is well laid out but rather deeply set back from the front panel, with the result that it cannot be read from some angles. On the whole though the control layout is unusually favourable. Note that even the minor controls are large, well signposted and adequately separated. From an aesthetic point of view, the RD-865 is something of an object lesson.

LAB REPORT

The deck is more heavily built than usual, partly due to the sturdiness of the casing and partly to a better endowed power supply. It also draws on BX series amplifier technology, for example in the basic topology of the record and playback amplifiers and in the use of high class capacitors and other components, including Signetics ICs in the record

and replay chains which were chosen for their sound quality rather than specifications.

The lab test programme clearly holds few fears for the 865, the deck flying through with comparative ease. The transport for example, is clearly a good one. The wow and flutter figures are low, and although some wow artefacts are visible in the spectrum analysis, the central peak is sharp, indicating fine pitch constancy. The absolute level of wow is low at match.

The various frequency responses are also pretty favourable on the whole. The fine bias control was centred for the response test, but the deck produced quite accurate response shapes from Type I and II tapes, only the Type IV metal test showing evidence of being underbiased. The low frequency response in all cases is clean and well extended. Pre-recorded tapes are reproduced with a 2dB HF lift, which is a reasonable result but not a good one.

SOUND QUALITY

The treble lift with prerecorded material was noted, but failed to seriously detract from an excellent standard of music making. I felt the Rotel could be criticised for being slightly weak in the area of very low level resolution, which to an extent was sacrificed on the altar of strong dynamics and high scores in presence and stability. But with commercial material it remains one of the very best handful of decks tested in this issue.

I'm not convinced that the Rotel sets new standards at the price, but even if it doesn't, it comes pretty close. This is one talented recorder. The most striking findings were the solid bass and midband. Orchestral string sound was positive and naturally layered, whilst percussive instruments tended to sound weighty with a sharply defined attack and a natural sustain. The deck benefited from the more energetic and consistent sound of high bias tapes, especially metals. At the same time, pitch integrity was good, very rarely being called into question at all.

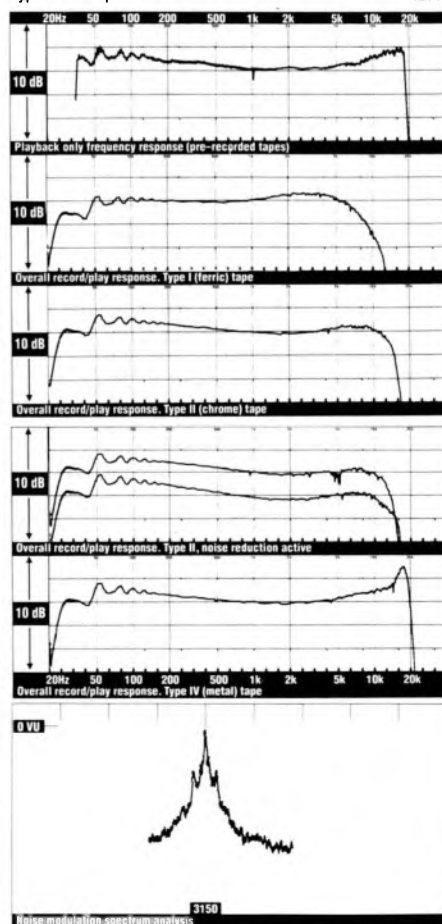
Dolby noise reduction detracted only marginally from the high standard achieved without, and on balance the extra reduction of hiss apparent with Dolby C was probably worth having over Dolby B. This isn't always the case.

CONCLUSIONS

The Rotel's strengths lie where several of its competitors are at their weakest. The audio electronics are unusually good both in consistency and absolute ability. The transport is about average for the price, but this too means good, and to go very much further means expensive complications like dual capstan transports. It's true that the solenoid actuators are truly agricultural, whilst equipment standards are a little lower than usual for the price. But it deserves a Best Buy for its unusually explicit and believable sound.

TEST RESULTS

Dolby Level (on cassette deck meters)	-3dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	25Hz - 10kHz
IEC Type II	25Hz - 16kHz
IEC Type IV	25Hz - 20kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.07%/0.13%
Wow/Flutter Peak DIN wtd	0.04%/0.14%
Speed error	-0.1%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.7%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.55%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.7%
Channel separation 0VU/1kHz	65dB
Line input sensitivity/overload	66mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	880mV/2.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.50%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	1dB
Dimensions (w x h x d)	44.5 x 11.5 x 32.5cms
Typical retail price inc VAT	£200



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SONY TC-FX110

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



The *TC-FX110* is a direct replacement for the *TC-FX150*, and is claimed to have a higher specification. The real differences however, are minor – for example the transport is a later issue of the same design. Perhaps the most obvious change is that the case depth has been increased from 250 to nearly 290mm, making stacking easier. In its essentials it is much the same – an ultra simple and very easily understood low cost tool for basic recording. Very basic . . .

The transport keypad is mechanically actuated, lacking such rudimentary niceties as auto-stop in fast forward or rewind modes. A mechanical latching pause control is provided, but you can forget all about track search, cueing or anything in fact other than record, play, pause, fast forward and rewind. Logging the contents of a tape is done the hard way, using the readouts on the mechanical tape counter.

On the electrical side, the deck accepts the usual three tape types but it must be told the tape group with the three IEC Type numbered buttons. Dolby B and C noise reduction are fitted. Input levels are set using a large ganged volume control and a small satellite balance control. Headphones are connected to a fixed level output, but microphones are not accommodated. The metering system is as basic as the rest of the player, covering from -10dB to $+6\text{dB}$, which is plainly inadequate. As the scaling figures are not illuminated they're hard to read in anything other than a brightly lit room.

LAB REPORT

Lab test results are dominated by two factors. One is the high level of wow and flutter, which is simply below par for a hi-fi product. However, in its favour, much of the problem is flutter; the wow contribution being relatively modest and therefore perceived speed stability isn't quite as bad as the figure suggests. The spectrum analysis graph shows this clearly, with the 3150Hz peak spread rather broadly in the plot, but with little evidence of discrete wow artefacts. However, the high level of flutter has a very discernible effect on recordings, and to an extent when playing back prerecorded material.

The other dominating feature is the appalling LF response shape which shows a confusion of head contour and other

resonant effects. In stark contrast to this, the overall record/replay responses are surprisingly well engineered, remaining essentially flat most of the way to the MPX rejection area around 19kHz. Only the playback response shape varies from this, showing a slow but consistent downwards trend.

Signal to noise and distortion results are unexceptionable, with some build-up of IM distortion, and a significant measured head azimuth error, but THD levels at 0VU are satisfactory and the deck can be driven reasonably hard without audible distress or particularly heavy distortion.

SOUND QUALITY

I have made no attempt to compare this model to its predecessor, but I am judging it against higher standards this time around, which is only appropriate given the generally improving standards of modern cassette decks.

The *FX110* is not a success with pre-recorded material. It sounds dull and woolly, with a soggy and over-full bass characteristic clearly presaged in the frequency response plot. The Sony fares better as a recorder, and sounds surprisingly lively and free of compression with metal tapes, even though it is far from being good enough to extract the best from such tapes. However, it also has a rough hewn quality. The bass is amorphous and lacking in a clear sense of pitch and 'shape' with some material, whilst the treble sounds ragged and coarse grained, especially with metal tapes. Even leaving the tape section of the machine to one side and simply auditioning the recorder's electronics through the amplifier tape monitor loop, the deck conspires to sound rather hard and compressed.

There is little to gain from expensive tape types – although a little less firmly projected, if anything the Sony sounds better balanced with a decent Type II tape. And on first acquaintance it provides the kind of sound that might impress some as being quite accurate. However, closer examination shows the limitations, which are largely found at the two extremes of the audio frequency band.

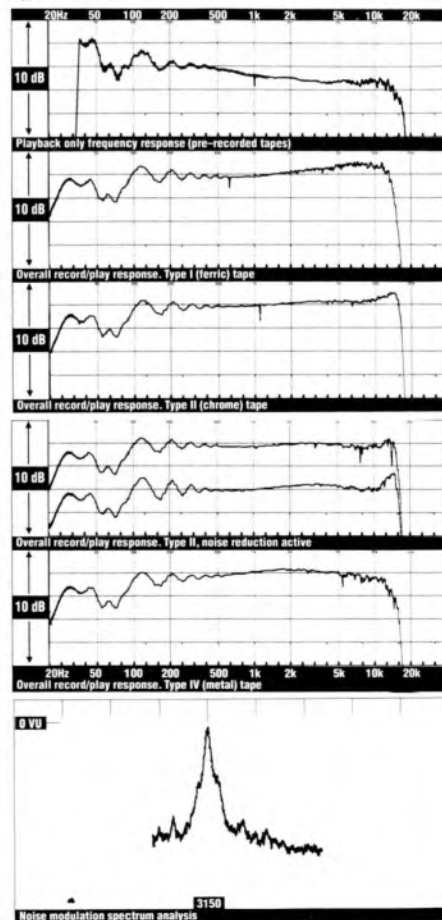
CONCLUSIONS

The one truly excellent feature of the *FX110* is that it really is very easy to pick up and to

use. Anyone who has ever had a battery portable will feel instantly at home. But it would be easier still had Sony fitted automatic tape type sensing. Manual selectors are an unnecessary complication. More to the point however, is whether you have the right to expect a cassette deck at this price to be more *musically* rewarding, and in today's conditions I think the answer has to be 'yes'. Considerably better can be had for not very much more money. Somewhat regretfully then I have to report that the Sony fails to gain a recommendation. The cost cutting measures have cut a little too deep.

TEST RESULTS

Dolby Level (on cassette deck meters)	-1dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	25Hz - 15kHz
IEC Type II	25Hz - 17kHz
IEC Type IV	25Hz - 15kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.20%/0.28%
Wow/Flutter Peak DIN wtd	0.15%/0.23%
Speed error	+0.07%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.6%
Type II signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	1.2%
Type IV signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.65%
Channel separation 0VU/1kHz	70dB
Line input sensitivity/overload	104mV > 13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	710mV/3.0V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	5.6%
Azimuth check R-L phase at 10kHz	170°
VU indication at IEC 0dB	+3dB
Dimensions (w x h x d)	43 x 12 x 29cms
Typical retail price inc VAT	£90



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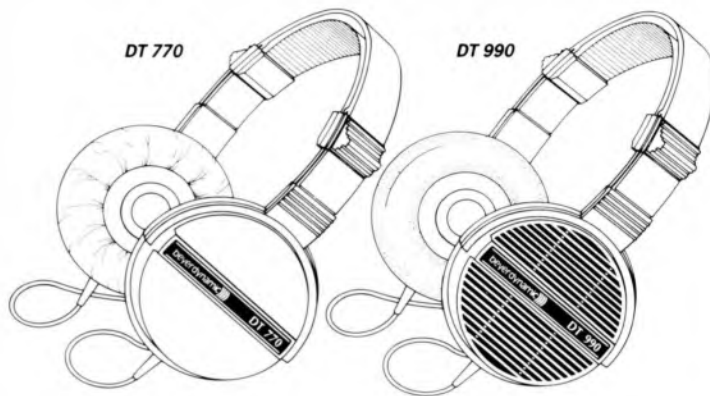
Perhaps we could persuade you that it will go nicely with other status symbols, like your Porsche.

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SONY TC-RX55

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RECOMMENDED



The *TC-RX55* is a distinctive addition to the low cost auto-reverse market. Like most Sony separates it is sharply styled and has an aura of quality that eludes a number of its counterparts. It's also reasonably well equipped.

What it lacks, to deal with the negatives at the outset, is optical end-of-side changeover. The deck attempts to record on the leader when it reaches the end of side which means that there's a ten second gap in the middle of recordings that span the changeover, just enough to make a nonsense of certain types of music, or of intricate plots to radio plays. C'est la vie, as they say in paradise.

The *TC-RX55* is equipped with Dolby HX Pro headroom expansion circuitry in addition to the two standard Dolby noise reduction processes. The solenoid operated transport control panel is strung out in a long row beneath the display area, with two adjacent play buttons for the normal and reverse play modes, the fast wind and other modes flanking them. The transport facilitates cue and review operations but without an audible output.

The display includes an electronic tape counter, with a memory stop feature, and a short, medium resolution set of peak hold record level meters with markings which show recommended peak levels for the tape types. Other controls include direction mode switching (continuous auto reverse or one direction only) and a switch to defeat the MPX filter. Input levels are set using a large, friction locked twin rotary control, and inputs in the form of two 6.3mm jack sockets are fitted for microphones. An additional socket fed at fixed level drives headphones.

The *RX55* is sleekly and attractively laid out. The cassette drawer cover can be pulled away to allow ready access for cleaning heads and guides. The only adverse comment on the usability front is that transport engagement is extremely noisy, thanks to the solenoid actuators. On the plus side, a remote control (*RM-900W*) is available at £20 extra.

LAB REPORT

The Sony is equipped with a high tech laser-amorphous record/playback capable of laying high levels on to tape, and record amplifiers that are equally capable. Noise levels are low, distortion is also low, and the deck's capable of a wide operating dynamic

range. Speed stability figures are not comparable with unidirectional decks in the same price band, but the spectrum is fairly benign, with no sharp high level wow sidebands, just a general broadening of the peak.

Frequency response trends are remarkably uniform across all three tape groups, irrespective of whether a noise reduction system is switched in or not. There were two anomalies however. The low frequency end is very odd. There's a substantial rise in upper bass output with a peak around 60-70Hz, below which output dies away fairly rapidly. Much of this is due to poor head geometry. The play only response shape is also odd, rising by a full 4dB at the highest frequencies near the 18kHz final measuring point.

SOUND QUALITY

Prerecorded tapes sound more than acceptable, notwithstanding the measurement anomaly and audible brightness and 'grain'. But although the measurements suggest that speed stability is likely to prove suspect, the Sony was very seldom caught out. It certainly never sounded as clean and secure as the best, but it never sounded overtly unstable either. However, it did sound lively.

The deck was also a success making its own recordings. Compared to other ostensibly comparable cassette decks, the Sony is impressive for its liveliness and speed, and the excellent sense of control. Definition is pin sharp making the deck more than usually transparent; it's easier to ignore than many which has to be a good thing. Stereo imagery is also more explicit than some, though there's a residual flatness to the depth plane that marks it out. Low end performance lacks the middle frequency precision. As so often with cassette decks, there's a slight excess of weight combined with a loss of focus and pitch integrity with critical material (acoustic bass, organ etc).

The advantage was with metal tapes, which gave less compression and better top end clarity and consistency, especially at higher recording levels. Dolby HX Pro is supposed to close the gap by making low bias tapes behave like metal ones (that's a simplification, but on the whole it's a workable one). On the evidence of this deck, it falls some way short of expectations, and lower bias tapes, Type I (ferric) types especially,

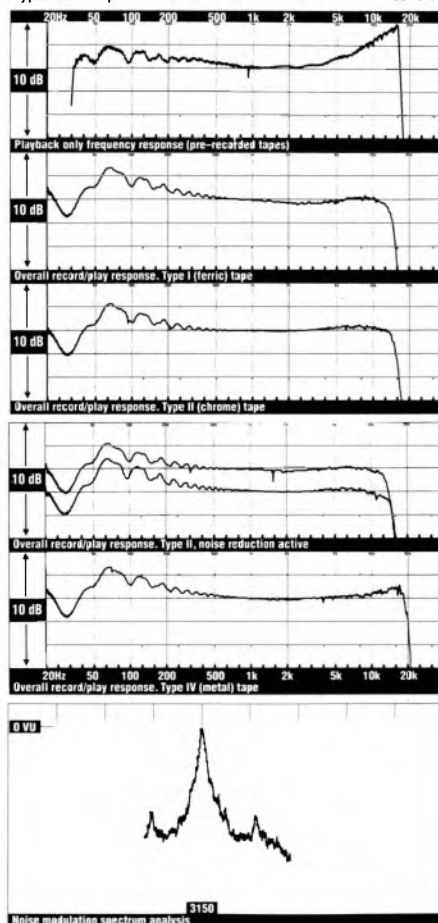
sound significantly less sharply focused. At the same time, there certainly isn't the yawning gap you find with non HX Pro recorders.

CONCLUSIONS

The day someone invents the flawless £150 cassette deck will be one to note in the calendars. The loss of euphony from a notional ideal standard is fully in line with the price and specifications. Although the bass end is well balanced, it's a little soft on precision and stability. Elsewhere it can be categorised as clean and sharp. It's obviously good value, and a strong candidate for Recommendation.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response —3dB ref 1kHz	
IEC Type I	20Hz - 15kHz
IEC Type II	20Hz - 15kHz
IEC Type IV	20Hz - 20kHz
Wow & Flutter — Peak DIN wtd/unwtd	0.13%/0.23%
Wow/Flutter Peak DIN wtd	0.08%/0.23%
Speed error	FWD +0.11%/REV +0.09%
Type I signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.7%
Type II signal/noise CCIR/ARM 400Hz	56dB
distortion 0dB	0.7%
Type IV signal/noise CCIR/ARM 400Hz	52dB
distortion 0dB	0.9%
Channel separation DVU/1kHz	71dB
Line input sensitivity/overload	100mV/>13V
Mic input sensitivity/overload	0.38mV/38mV
Line output for 0dB/maximum	670mV/3.7V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	0.25%
Azimuth check R-L phase at 10kHz	15/15° FWD/REV
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	43 x 12 x 29.5cms
Typical retail price inc VAT	£149.95



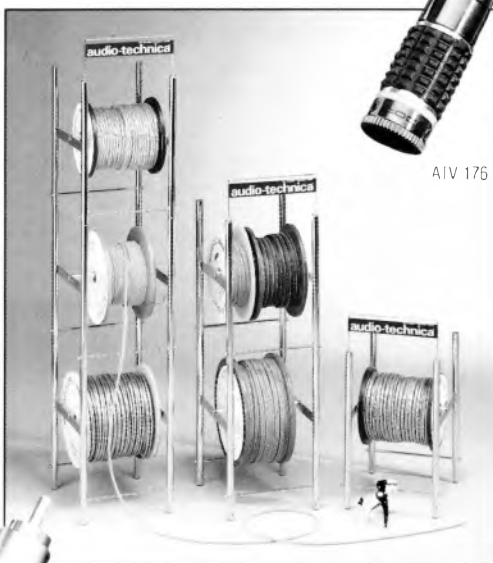
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TEAC V-285CHX

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



The V-285CHX is a low end cassette deck, and the first thing to be said is that it ain't a pretty sight. Never mind; it's neither gimmicky nor flashy. It is, by contrast, purposeful and above all practical. How is it to listen to?

First things first – the V-285 is a unidirectional two head cassette deck (well what did you expect) fitted with Dolby B and C noise reduction. A fine bias control is fitted, but the effect of it is gross and adjustment should be performed with care. It works with all three tape types, in contrast to some other budget decks where metal tape is excluded. The 285 also has Dolby HX Pro headroom expansion circuitry.

The transport system is mechanically actuated using a very well engineered if cramped set of mechanical lever switches below the soft eject loading door. There are no problems here except that some of the controls are rather stiff, and on certain surfaces the deck will slide around whilst being operated. There are no track search facilities, just a mechanical tape counter.

I have some criticisms of the way certain of the controls work. For example Dolby switching uses two mutually dependent switches, which could lead to error. More significant perhaps, the three tape types are also selected using two mutually dependent switches. Not only does the same criticism hold (with bells on since tape types are more likely to require resetting on a regular basis), Teac doesn't even have the excuse that it's cheaper this way. An auto-tape sensing device would certainly be cheaper still.

Next, although there's a nice large input level control, there's no input balance control, and the record level meters operate in mono. In effect they read the higher of the two channels, which perhaps wouldn't have been so bad except that they're dressed up to look like stereo meters. The range covered is from -10VU to +6VU in five steps. It has no headphone socket, which is sure to be missed, and the deck is very shallow (front to back) which could make vertical stacking difficult unless it is placed on top.

LAB REPORT

This is a simple deck, designed to be afforded by the masses, and the standards of judgement obviously shouldn't be too harsh. Even

so, performance ain't too wonderful. The sting in the tail of the Type IV record/replay response can be blamed on underbiasing of the test tape at the standard (central) position of the bias control, but this can be corrected quite effectively. The Type II response can be partly flattened out too, and the Type I plot already is. But in each case treble extension is rather limited, and at the other end of the audio band, there's very little bass output below 50Hz. In fact output is on a descending curve below 100Hz, which is scarcely exciting. By contrast, the measured playback only frequency response is surprisingly linear (viz: accurate).

Like other low cost decks, the Teac amplifiers are well on the way to clipping with some signals at 0VU, which corresponds to 5dB above Dolby level (though limited meter resolution casts some doubt on this figure).

The signal/noise figures must be interpreted in this light, and the message is not to peak recording levels too high. Taking all the figures together, the working dynamic range is a little limited. The transport is also below par as judged by the numbers. Low rate speed variations – wow – isn't desperately high, but flutter certainly is a little excessive at 0.20 per cent.

SOUND QUALITY

In the case of prerecorded material, the mid-band sounded over-damped and dry, and the bass 'boppy' and thin. The overall effect was somewhat shabby – an unhappy result that even on the best interpretation led to the deck sounding materially less communicative playing music than some of the other Teac models.

As a recorder the Teac was no more successful. Again there was a pervading dryness and a treble that sounded coarse and ill-differentiated. There was considerable compression too, affecting all tape types to an extent, but low bias tapes most of all, assuming that all tapes had been set up to give approximately the same tonal balance using the fine bias control. Again though the bass was bad news, being thin and unatmospheric when recording from source material bearing the strong low and middle frequency 'thumbprint' of the recording venue's acoustic. To add to the good tidings, it was very easy to drive recordings into distortion, which set in

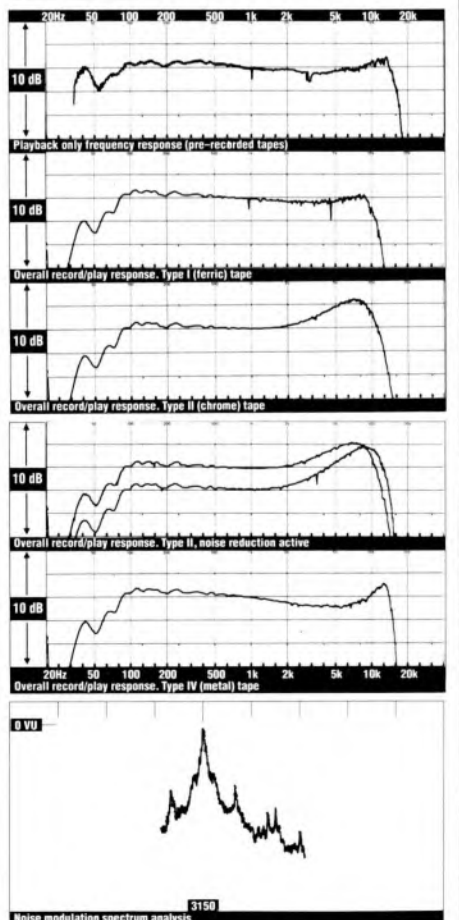
quickly and with devastating effect.

CONCLUSIONS

My hope at the outset had been that value for money would pull the 285 through even if absolute sound quality was not going to be enough in its own right. It was not to be. I have few complaints about facilities apart from the metering 'cheat' and the lack of a headphone socket, which won't be important to everybody. The blandness, raggedness and lack of other humanising influences on the sound tell their own story however. Others do it better, and you don't need to spend more.

TEST RESULTS

Dolby Level (on cassette deck meters)	-5dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	28Hz - 12kHz
IEC Type II	28Hz - 13kHz
IEC Type IV	28Hz - 15kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.10%/0.22%
Wow/Flutter Peak DIN wtd	0.07%/0.20%
Speed error	+0.1%
Type I signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.95%
Type II signal/noise CCIR/ARM 400Hz	55dB
distortion 0dB	0.9%
Type IV signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.9%
Channel separation 0VU/1kHz	62dB
Line input sensitivity/overload	79mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	500mV/2.5V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	10.2%
Azimuth check R-L phase at 10kHz	0°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	43.5 x 12 x 21.5cms
Typical retail price inc VAT	£115



TEAC W-355

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



If your requirements are for a basic twin transport cassette deck for dubbing purposes then this could be the machine for you. However, I would be remiss if I didn't point out that cheap twin cassette decks necessarily mean compromise, and that big price savings even more inevitably means big compromises. Caveat emptor is the name of this game.

The '355's two main components consist of a basic playback only transport (deck I) and one which is used for recording and playing back (deck II). Each is equipped with similar control systems in the form of a row of mechanical keys with a good, positive and relatively light feel, except in the case of the record control which resisted manfully every time it was asked to do its thing.

Basic in the context of the W-355 certainly means basic. It doesn't however, mean deprived. Of course you can use the deck to dub cassettes, either in real time or at double speed to save time. Record levels are set manually (except when dubbing of course, where theory dictates that source tape is copied faithfully. So much for theory . . .). The '355 can also be used in continuous (actually sequential) mode, with the playback of one tape following the other. Dolby B noise reduction can be used, but with this deck Dolby C isn't available. Both decks are equipped with full autostop and a tape counter is fitted for use on deck II only.

Amongst the Teac's limitations are the following. Although tape type selection is automatic on the playback transport, when recording the type of tape has to be specified - not using a nice, understandable row of three buttons or a three-way switch, but the hard way using two mutually dependent switches. Dubbing starts are not single key operations as with most modern decks. Headphones cannot be connected directly to the '355 and finally, although the 16dB two colour record level meters are laid out in two columns, which implies that they operate in stereo, in fact they're mono. In my opinion, this trick (and that's what it is) is unworthy of a respectable manufacturer.

LAB REPORT

The frequency responses look rather erratic. The IEC Type II is the best match of the three, and an accurate Dolby installation

means there is no additional amplitude discrepancy from this source at least. The Type I plot is fair if the slight downwards tilt at HF is allowed for, but the Type IV plot appears to suffer from a combination of underbiasing and incorrect equalisation. It is, in short, a mess - but not as much so as the playback response shapes which were run on the two transports with completely different results. In this test at least, deck I, the playback only one, is much the better of the two.

Deck I doesn't do as well elsewhere. The playback transport offers very poor wow and flutter, the weighted figure being nearly 70 per cent worse than the already very marginal figures achieved by the record/playback transport. These are the kind of numbers you'd expect from a portable cassette deck. A good portable admittedly, but still a portable. There are other shortcomings too. Dolby level appears at no less than -5dB on the very vague meters, which are also inclined to under-read on transient material, making the whole question of setting appropriate record levels somewhat chancy. Signal/noise figures are a little below average, and the deck's electronics are likely to clip early if pressed.

SOUND QUALITY

Different as the two transports measured and sounded, I discovered a fundamentally articulate quality when playing back prerecorded material I missed with some of the other Teac models. Nevertheless a touch of roughness, probably caused by flutter effects, took the edge off, and as the measurements promised, deck II sounded consistently muddled and compressed compared to deck I.

One of the problems noted early on with the '355 is that tape to head contact is not as even as with some, and I also heard Dolby 'breathing' effects with certain material.

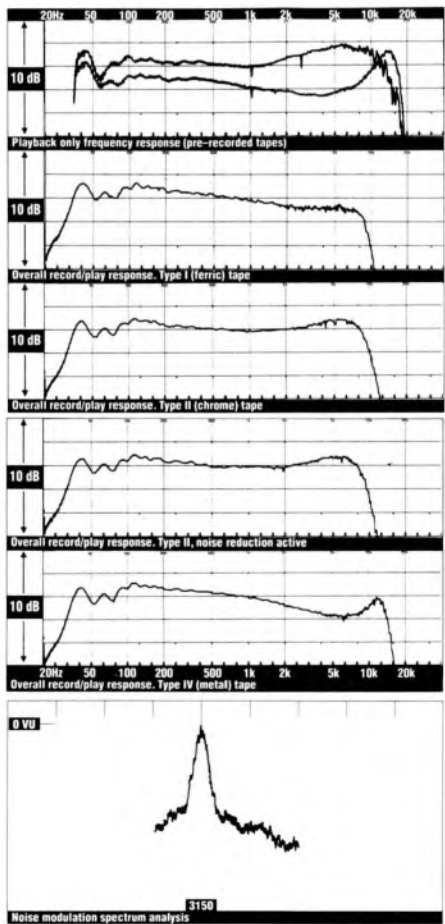
The really strange thing about this recorder was that although it provided just about every reason to dislike it you could think of, it persistently confounded expectations by making recordings that were really quite enjoyable. With chromes and metals the deck sounded distinctly rough and ready, but also lively and, well, I suppose plausible is the best single word conclusion. Metal tapes really aren't recommendable in the end because chromes sound better and cost less.

CONCLUSIONS

Use something like the TDK SA I used for much of the listening tests, and the Teac W-355 may just pull the odd rabbit from the hat. The deck is a bit rough and ready in many ways, and it never sounds either especially stable or sophisticated. I appreciated its raw sense of detail and clarity however, and as a bare bones twin deck, it merits a very serious 'worth considering'.

TEST RESULTS

Dolby Level (on cassette deck meters)	-5dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	20Hz - 9kHz
IEC Type II	20Hz - 10kHz
IEC Type IV	20Hz - 15kHz
Wow & Flutter - Peak DIN wtd/unwtd	I - 0.25%/0.30%
	II - 0.15%/0.20%
	I - 0.18%/0.25%
	II - 0.10%/0.18%
Wow/Flutter Peak DIN wtd	I - +0.8%/II - 0.9%
Speed error	
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.70%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.90%
Channel separation 0VU/1kHz	63dB
Line input sensitivity/overload	101mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	580mV/2.7V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	3.7%
Azimuth check R-L phase at 10kHz	I - 30°/II - 25°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	43.5 x 12 x 21.5cms
Typical retail price inc VAT	£119



TEAC V-480

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

RECOMMENDED



For a mere £14 more than the *V-285CHX*, Teac offers another model with not altogether dissimilar specifications – the *W-480*.

It's natural and appropriate to compare the *V-480* to the *285* but not all that rewarding since most of the differences are matters of style or for some other reason trivial. For example one obvious difference is that the *V-480* is substantially deeper than the *285*, which certainly makes life simpler when stacking components, but bears scant relation to what is to be found inside the box. Similarly, the *V-480* has a light acting logic controlled transport. The *V-285* appears to have much the same transport, but it's controlled mechanically. There are no important resulting functional differences. Both for example offer timer standby, albeit through the offices of a purpose made circuit on the *V-480* and fortuitously, as a consequence of the mechanical transport interlinks on the cheaper model. But the dearer model is more pleasing to use. Other extras on the *480*, for what they're worth, include a headphone socket, a record mute facility and a rear panel bus link for remote control operation via a separate Teac system.

Both models also have fine bias controls, Dolby B and C noise reduction and Dolby HX Pro, the now well known and widely used headroom expansion circuit. There are very few other features of note. Tape search aids for example are all but ignored by Teac. Other than a mechanical tape counter (there's no memory stop in case you were wondering) only guesswork will find the places you want. Setting record levels also involves an element of guesswork as the meters are unresponsive and inclined to under-read. They cover a mere 16dB in five steps and are mono rather than stereo, even though at first sight they appear to be stereo.

LAB REPORT

A favourable geometry record/playback head design helps imbue the *V-480* with a relatively clean LF performance, at least by Teac standards. However, in common with most of the low cost Teacs the overall frequency response shapes are all over the place. For example important chrome (Type II) response appears to be incorrectly equalised, leading to a near-4dB rise above 10kHz. The Type IV plot is much closer to being accurate,

but is still a little underbiased, and the Type I ferric shape loses treble nearly as fast as Type II tape puts it on at higher frequencies. To a limited extent these errors can be put right using the bias control. Given the measured response error, it's hard to tell if the Dolby installation is materially out of kilter or not. The replay only response, applicable with prerecorded material, suffers an enormous HF boost.

Many of the other numbers however are considerably better. Wow and flutter for example is quite respectable for a deck at this price level, and incidentally a real improvement on the *V-285*, especially in the area of wow. Noise and distortion figures are also quite reasonable, and the electronics evidently suffer less HF congestion when fed the composite IM test signal that causes some of the other Teacs so much trouble.

SOUND QUALITY

Predictably, recorded cassettes sounded bright and thin in the extreme treble, but the sound was reasonably smooth (except, sometimes, deep into the treble itself) and instrumental and vocal separation was quite good. There was, in short, some vitality to the sound in this mode, however mediocre the raw numbers may look on paper.

Incorrectly equalised recordings however, cannot be corrected by rebiasing. In a way you only confound the error, and it was quite common with this deck to find that the upper frequencies were unnaturally, even hyperactively 'alive', that the harmonic structure of familiar sounding instruments sounded odd so that the sound as a whole was either coloured or in effect remixed, as though it was being miked in a different way. Metal tapes, which on the whole were correctly driven once the optimum bias setting had been made, make quite lively and clear sounding recordings, with satisfactory intrinsic separation and a well balanced mid/top balance. Chrome recordings tended to sound either rather fierce, or sometimes they sounded coloured. Ferric recordings were similar, sounding as heard through a pair of modestly effective earplugs.

In short there were some good points to this deck. Its underlying ability is relatively strong, though it sounds at its most coherent and vibrant with metal tapes, which many

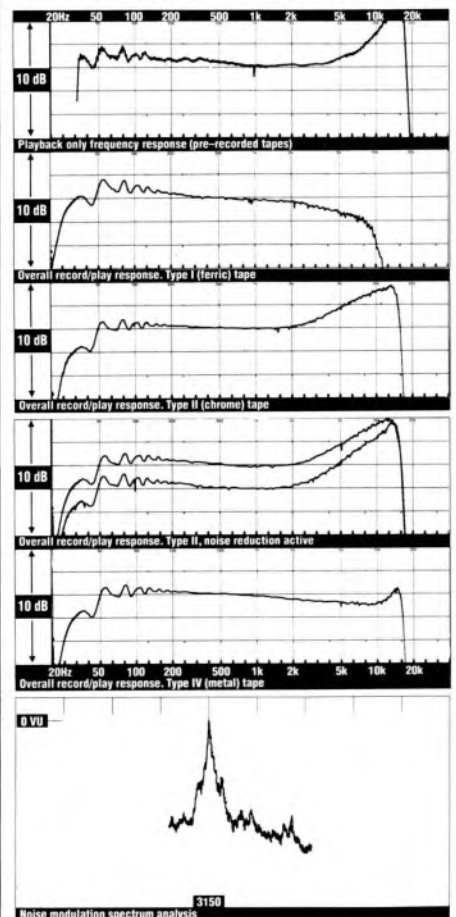
people will find hard to justify on quality grounds. Irrespective of the *improvements* they offer over Type IIs, the *absolute standards* they provide are still little better than moderately good.

CONCLUSIONS

'Moderately good' with expensive tapes and 'good but...' with prerecorded material just about adds up in this case, given that the price is pretty low. In general sound quality is a little better than the numbers might lead you to expect, and so the *V-480* can be Recommended with caution.

TEST RESULTS

Dolby Level (on cassette deck meters)	-5dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	24Hz - 9kHz
IEC Type II	24Hz - 16kHz
IEC Type IV	24Hz - 16kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.09%/0.15%
Wow/Flutter Peak DIN wtd	0.06%/0.13%
Speed error	+0.05%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.6%
Type IV signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.9%
Channel separation 0VU/1kHz	68dB
Line input sensitivity/overload	104mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	640mV/4.15V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	0.80%
Azimuth check R-L phase at 10kHz	60°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	43.5 x 13 x 26cms
Typical retail price inc VAT	£129

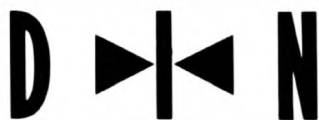


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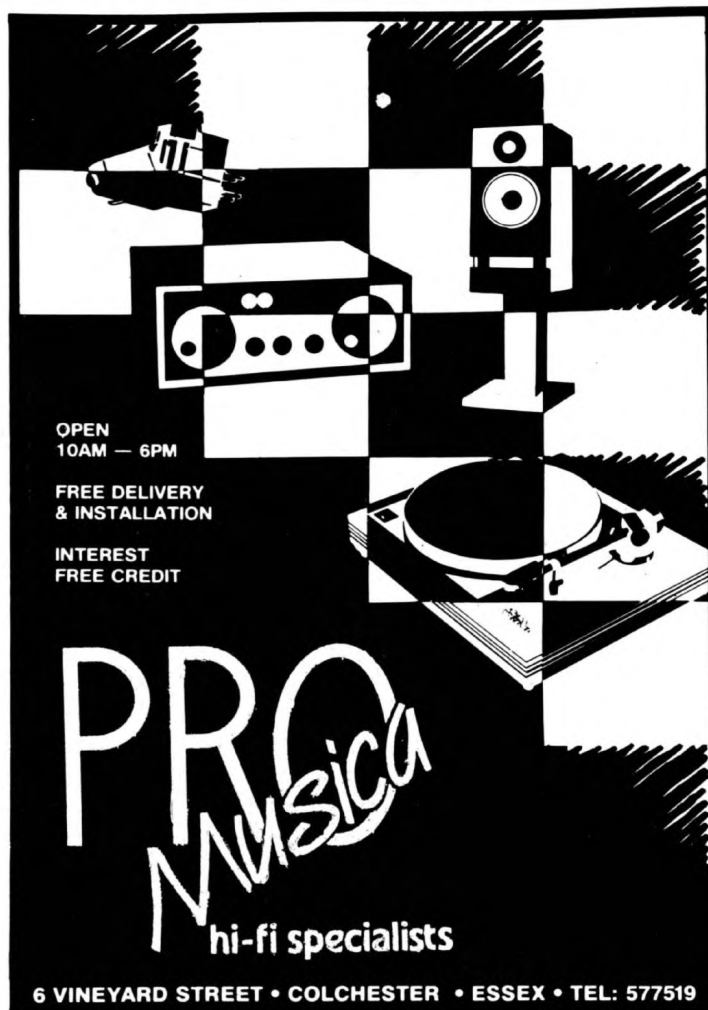
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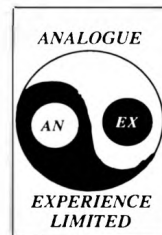
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TEAC W-450R

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The *W-450R* is neither bottom of the large Teac range nor an upmarket model, but a middle price, middle of the road design with some profoundly middle market values, facilities and abilities.

This is the story. Our two transports look pretty basic. In fact, although only one of them is a recorder, both are capable of auto-reverse operation, being fitted with a rotating head assembly. The transports appear to be simple mechanical devices, and indeed employ the same kind of actuators used for example on the *W-355*, which does have a simple mechanical transport. Additionally this one has a smooth geared headblock assembly providing an unexpected degree of finesse in tape handling, though the mechanical interlocks on the transport keys certainly contribute to the noise level. The finesse concept also breaks down whilst the tape is grinding its way through the auto-reverse procedure, whether manually or when automatically triggered.

The Teac has a simple next/last (actually current) track start search feature, though for some obscure reason only the non-recording transport is so equipped. Each deck has its own three-position mode switch allowing single direction, single plus return and continuous auto-reverse operation. Noise reduction is by Dolby B and C, and Dolby HX Pro is also included, which is unusual for a deck at this price/spec level. Dubbing is possible in the usual two modes: normal speed or completely unlistenable – sometimes also known as double speed. The Teac doesn't go in for one key dubbing starts, and if one tape finishes before the other, the second tape blithely carries on regardless.

Record levels are set using a single slide level control; there's no equivalent facility for varying record balance, and the supposedly stereo 26dB meters are in reality mono. A simple tape counter (for the recording transport) and both headphone and microphone inputs complete the description.

LAB REPORT

The measurements confirm what the price and specifications strongly imply: this in technical terms at least is a very modest cassette deck. Look for example at the rough and ready engineering of the transport as revealed in the numbers, though it's only fair

to note that low frequency wow effects are less pronounced in this deck than flutter, which is evident also by the lack of discrete sidebands in the spectrum analysis. Deck I – the playback only transport – also runs surprisingly fast.

By a similar token, system noise is considerably higher than it should be, and headroom is strictly limited with metal tapes especially, whilst the design of the meters leads them to consistently under-read music peak levels in practice. Low frequency head contour effects are visible in the frequency response traces up to well over 200Hz, and equalisation of Type II and IV tapes is a little suspect. So is Dolby record/replay integrity, especially in the case of Dolby C at the high frequency extreme. The replay only responses, by contrast, are quite favourable for both decks.

SOUND QUALITY

Given the absence of a bias adjust facility, the measured responses are the ones you're stuck with except insofar as they can be adjusted by changing tape formulations. But changing tapes won't do much good in the metal (Type IV) slot. It is possible to achieve a brighter response, but only at the expense of underbiasing, the audible outcome being rather shallow and noisy, with an exaggerated extreme HF which was often unnoticeable but could be set off by recorded cymbals or the like with unfavourable, caricatured results.

However, Type I and II tapes were fully compatible and in common with certain of the other Teac models tested this time gave results that were in some respects better than might have been expected. Although of no great sophistication, it appears that the electronics have a kind of rough honesty born perhaps of simplicity. Of course it was easy enough to make the *450* misbehave. Tapes dubbed from other tapes sounded rather like poor copies of poor copies generally do, and when the tape was dubbed at high speed, results are only suitable for what is sometimes euphemistically referred to as entertainment.

The difference in playback speeds of the two transports is clearly audible and will annoy those sensitive to pitch. Pre-recorded material sounded fair but rather dry and

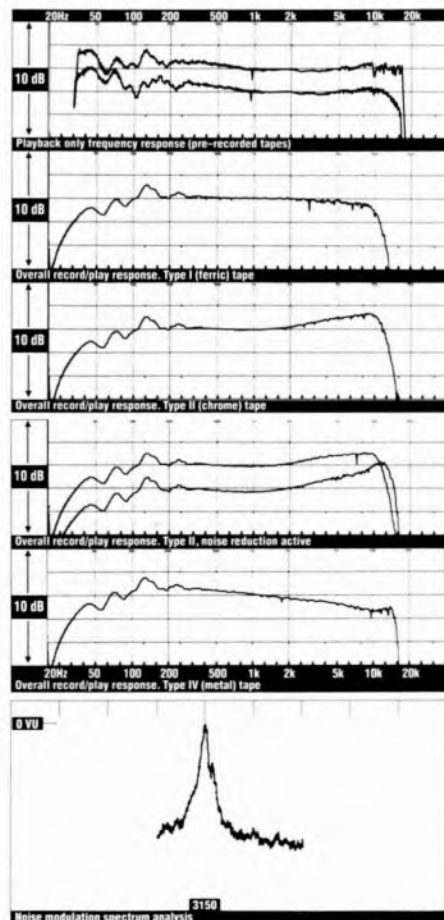
undemonstrative, and with more than a suggestion of flutter induced top end 'grain' and lack of detail analysis into the bargain.

CONCLUSIONS

Perhaps more than with any of the other Teac twin transport models, the *450* seems an awful lot of cassette deck for the money. Musically it does little that the £40 cheaper *W-355* can't do at least as well, but auto-reverse is important to many, and in the classic phrase, this model is worth considering.

TEST RESULTS

Dolby Level (on cassette deck meters)	–5dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	28Hz – 12kHz
IEC Type II	30Hz – 13kHz
IEC Type IV	30Hz – 16kHz
Wow & Flutter – Peak DIN wtd/unwtd	FWD – 0.15%/0.25% REV – 0.18%/0.25%
Wow/Flutter Peak DIN wtd	
	FWD/REV – 0.10%/0.13%/0.23%/0.25%
Speed error	Deck I – +1.00%/Deck II – +0.40%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	51dB
distortion 0dB	0.50%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.70%
Channel separation 0VU/1kHz	68dB
Line input sensitivity/overload	98mV/>13V
Mic input sensitivity/overload	0.49mV/7mV
Line output for 0dB/maximum	6.38mV/3.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	5.53%
Azimuth check R-L phase at 10kHz	FWD/REV I – 0/50° FWD/REV II – 150/110°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	43.5 x 13 x 26cms
Typical retail price inc VAT	£159



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TEAC W-470

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Although it costs a comparatively modest £179, this is the most ambitious and expensive of the three Teac twin transport models reviewed in this issue.

The *W-470* is a little out of keeping with its Teac counterparts, as in nearly every respect it is built to a higher standard. Typical clues to this are to be found in the dumping of the auto-reverse mechanisms used in the next model down range, in favour of unidirectional transports, and in the heads which in the same comparison have a more sophisticated geometry. The *W-470* is also the recipient of full soft-touch logic buffered control sets which are again a great deal more sophisticated than those of cheaper Teacs.

However, there were some surprising omissions. The microphone inputs are gone, which probably helps by diverting resources where they can do more good, but so is Dolby HX Pro, which is generally regarded as a quality-related measure. And in common with the cheaper model, the *W-470* still lacks proper stereo record level metering – the meters used are the 16dB excuses used in other twin deck Teacs which are commented on separately – and there's no input balance control.

What then does the *470* offer apart from what has already been described? Dolby B and C noise reduction of course, and a simple tape counter attached to the record capable transport. Of more interest than these standard issue items is an intro search feature on the playback transport (this neatly circumvents the need for track search), and one key dubbing starts. There's a continuous play feature too which will rewind the second tape without needing to be instructed to do so (if required) whilst it's busy playing the first. An external remote control bus link is also provided for use with Teac branded systems.

LAB REPORT

I was intrigued to discover that despite the *W-470*'s relatively grandiose ambitions, the transports appear to offer only quite rudimentary standards of engineering, one example of which is the very poor way in which the record and playback heads are supported. The test programme also demonstrated that the two transports are barely if any better than those of the cheaper Teacs, and even leaving the possibly invidious comparisons to

one side they could hardly be described as satisfactory. The spectrum analysis shows plenty of evidence of loss of pitch specificity though only modest levels of discrete wow.

Low frequency linearity is improved by virtues of the hyperbolic head profiles, but mid and high frequency behaviour is a little adrift with all tape types, though not in accordance with any readily discernible pattern, and not to any great extent. High frequency extension is lacking too, the Type I upper response limit not even making double figures (measured in kHz of course) and the Type II plot only barely doing so. Dolby B replay integrity is good, but the use of Dolby C appears to result in some high frequency mistracking. The playback only shape indicates what can all too clearly be heard – a rather thin, bright sound which results from the 3-4dB (the two transports differ by 1dB) rise over 12kHz. Noise and distortion figures however, are satisfactory, and the HF IM distortion figure is low, implying better engineering here than in several of the other Teac models.

SOUND QUALITY

The excess treble experienced through the playback only tests paradoxically helps by adding some admittedly false range, colour and dynamics in the sound, though it's also responsible for some very obvious anomalies – occasional screeching violins, aggressively forward percussion, grainy tape hiss. On the other hand, it's undeniable that with an accurately calibrated response, such as some of the Teacs possess, the resulting sound is often rather drab and grey. In this case it's quite good except that (a) the treble is clearly excessive, and (b) there's a price to pay in treble uniformity and audibility of drop-out and tape hiss.

The electronics are a little more transparent than some. There isn't quite the power or expressiveness that characterises a truly first rate recorder, but I remained impressed by the pervading liveliness and stability of sound with all tape groups (absence of Dolby HX Pro notwithstanding), and by the ease with which it covered its own tracks. For example Dolby C noise reduction turned out to be relatively transparent, though Dolby B was preferred where residual hiss wasn't a problem, especially through denser, more congested musical passages.

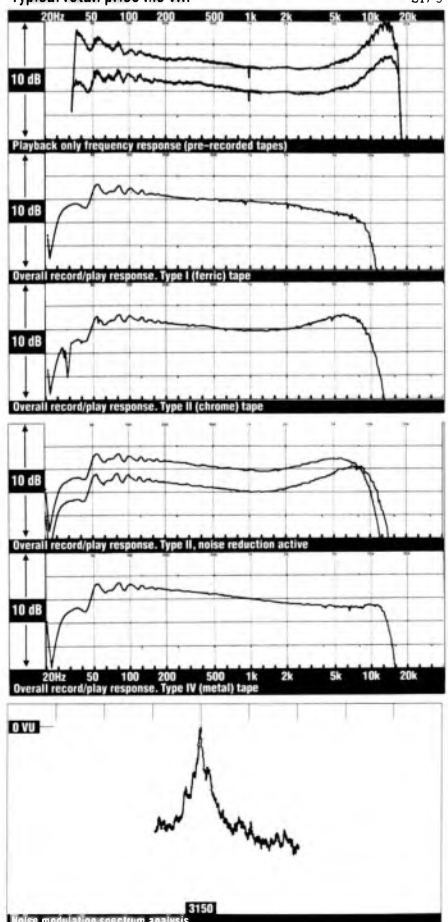
Normal speed dubbing performance was satisfactory, high speed less so.

CONCLUSIONS

A touch of ambivalence is in order with this bundle of mixed blessings. In the end I feel a direct recommendation is not really merited due to an intrinsic lack of accuracy in some modes of use, for example when playing pre-recorded material. Even so, the *W-470* can sound quite engaging, and minor niggles aside, is very pleasant and easy to use. Bubbling under.

TEST RESULTS

Dolby Level (on cassette deck meters)	—5dB
Rec/replay response —3dB ref 1kHz	
IEC Type I	25Hz —9kHz
IEC Type II	25Hz —11kHz
IEC Type IV	25Hz —13kHz
Wow & Flutter — Peak DIN wtd/unwtd	I — 0.20%/0.25%
	II — 0.15%/0.23%
Wow/Flutter Peak DIN wtd	I — 0.15%/0.23%
	II — 0.13%/0.20%
Speed error	I — +1.02%/II — +1.01%
Type I signal/noise CCIR/ARM 400Hz	47dB
distortion 0dB	0.7%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.65%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.75%
Channel separation OVU/1kHz	70dB
Line input sensitivity/overload	91mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	570mV/4.2V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.89%
Azimuth check R-L phase at 10kHz	I — 40°/II — 60°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	43.5 x 13 x 26cms
Typical retail price inc VAT	£179



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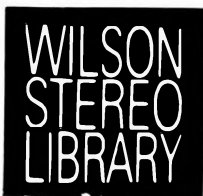
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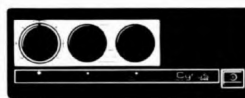
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TEAC R-919X

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This is one of a very rare breed indeed, a deck that attempts to combine under one roof such attributes as three heads with real time off-tape monitoring and an auto-reverse mechanism. As if this wasn't enough, the deck also offers a full tape calibration system and a multiplicity of convenience and other features, including dbx . . .

The *R-919X* is a heavyweight in every sense, and is very well built and finished. The back-lit cassette well is populated with central saimesed record and playback heads fitted to a stable rotating platform, flanked with erase heads and capstans. The three-motor mechanism is driven by software which can repeat random blocks, to find tracks (not just the last or next track, or just on one side of the tape either) and perform an intro-scan, or skip blank passages, repeat sections and so on. The timer reads numbers or time, and shares the display window with other fluorescent displays, including decent quality 32dB meters.

All the noise reduction circuits – Dolby B, C and dbx – are of course doubled up to facilitate monitoring of the finished decoded signal. MPX switching and Dolby HX Pro are included. The auto-reverse mechanism is also a goodie, with optical end of side change triggering to reduce loss of signal from about ten to under one second. Tape source monitoring is automatic with a manual override.

Finally, there's the small block of controls on the right hand side of the fascia concerned with tape calibration. Essentially, it's a manual system that allows the user to set bias and sensitivity for each channel independently by adjusting four controls to a specific meter reading. Teac's way of implementing this feature is both practical and clever. A further feature enables a CD being scanned at speed to be used to set record levels.

LAB REPORT

In principle the noise reduction systems are responsible for about 10dB, 20dB and 30dB+ of weighted noise reduction. In practical, everyday terms dbx should offer near silence and Dolby C not much less, whilst Dolby B, the least manipulative circuit and therefore often the least intrusive with music, gives a modest 10dB and compatibility with prerecorded cassettes. Yet in this case the static noise reduction achieved by dbx (ref 0VU

using CCIR/ARM weighting) was just 9dB better than Dolby B. Dolby C, which should have provided an extra 10dB (ie 1dB better than dbx actually achieved) actually gave just 7dB extra. These figures are not measured under the conditions that Dolby or dbx specify, but the idea of course is to show their circuits in their best light (see also next section).

Despite the tape calibration system, each of the record/replay results give an elevated bass (a wideband and therefore almost certainly audible couple of dB). The Type I response slowly rolls off after 5kHz, and Type II above 7-8kHz. Only Type IV is a little more extended. The noise reduction systems look progressively more and more saddle shaped, dbx for example dipping down a couple of dB into the 1kHz slot, rising a dB or so at 6kHz, and rolling away quickly thereafter. Dolby C is slightly flatter but if anything starts to roll away even earlier. Only the Dolby B shape successfully mirrors the intrinsic Type II response shape. The prerecorded run looks a little dishd, but okay.

The spectrum analysis is very clean, with just one obvious but low level wow effect, perhaps due to an off-centre capstan.

SOUND QUALITY

It's instructive to try the different noise reduction systems using an optimised (ie calibrated) tape, preferably a metal one, and to discover that with each change to a more powerful system, the sound becomes less open, more synthetic and less communicative. The dbx system is an inconsistent one, while Dolby C doesn't show too well on this machine either. Nor indeed do ferric or chrome (Type I and II) tapes, albeit for quite different reasons. Each of these suffers from lack of treble extension by sounding 'grey' and poorly differentiated. The problems weren't resolved entirely with metal tapes either. To a greater or lesser extent all the tapes I used sounded significantly compressed (even at the low level end of the dynamic range envelope), and all lacked detail, openness in the midband – and all had a slightly defocused and loose sounding LF.

There were good points of course. The Teac sounded impressively stable (despite occasional dropouts) and prerecorded material was generally cleanly presented. But at

this price we're entitled to ask for more.

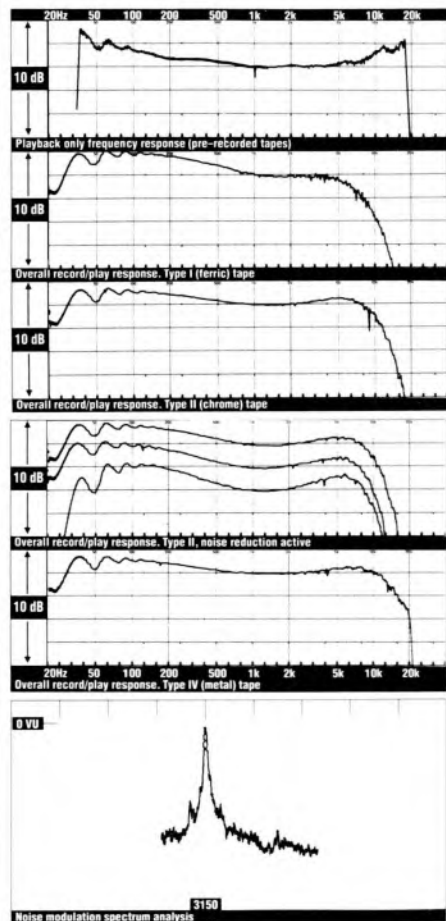
CONCLUSIONS

I for one would very much welcome a cassette deck with this level of specification if it did its job well. In particular I liked the *919's* calibration system (though not the fact that it didn't work very accurately), and the combination of off-tape monitoring and auto-reverse I find nearly irresistible.

Ultimately though, quite a lot has been sacrificed on the musical front to achieve these ends within the chosen price point.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	<20Hz – 18kHz
IEC Type II	<20Hz – 20kHz
IEC Type IV	<20Hz – 21kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.06%/0.09%
Wow/Flutter Peak DIN wtd	0.05%/0.07%
Speed error	FWD – +0.02%/REV – +0.03%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	0.6%
Type II signal/noise CCIR/ARM 400Hz	53dB
distortion 0dB	0.75%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.7%
Channel separation 0VU/1kHz	73dB
Line input sensitivity/overload	106mV > 13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	480mV/3.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.6%
Azimuth check R-L phase at 10kHz	FWD – 0°/REV – 20°
VU indication at IEC 0dB	2dB
Dimensions (w x h x d)	43.5 x 12.5 x 28cms
Typical retail price inc VAT	£599



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TECHNICS RS-TR255

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RECOMMENDED



The *RS-TR255* is a twin transport deck, but with one of the two transports only suitable for playback purposes. It's not capable of auto-reverse operations, and is primarily designed for dubbing and series (sequential) play operations, the second of which will operate continuously for eight complete cycles, for reasons that are not immediately obvious. The main recording transport of course is the auto-reverse one, with end of side direction change actuated at the wrong end of the leader, meaning an unavoidable ten second-odd gap with any recording that spans the changeover.

There are few other problems. Both transports are controlled by large, well laid out keypads, with one-key dubbing starts in real time or double speed, the latter only usable when sound quality doesn't matter. The record deck is paused if the source tape runs out first, which being unidirectional is quite likely. Audible cueing in both directions is possible, which is still far from common. Record level meters cover just 16dB in five steps, with higher levels picked out in red.

There are a couple of minor derogatory points to make from the ease of use point of view – nothing major, but worth bearing in mind. One is the use of twin adjacent rotary input controls, making it hard to perform matched fades at the start and end of recordings, a not unreasonable requirement. The other is that although it has illuminated meters and status displays (a record telltale and others for play, direction and so on), none of the legends that accompany them are similarly lit. These things said, the *255* is attractive, and could hardly be described as hard to master.

LAB REPORT

With all three tape types, the low frequency end is somewhat uneven and curtailed. At the other end of the audio frequency band the response shape varies with the tape type in a particularly interesting way. Whilst the ferric position gives a slightly dull measured response, Type IIs are effectively flat and metals are a touch bright – almost as though a deliberate decision has been made to engineer a more punchy, aggressive sound with the more expensive, higher bias tape types. Both Dolby circuits also lent the intrinsic shape an upwards tilt – upwards

into the treble that is. This is just about acceptable with Type Is (especially) and Type IIs, but is less tolerable with metals since the effect is additive.

The wow and flutter figures given are about par for the course for a low cost auto-reverse mechanism, though interestingly the unidirectional playback mechanism is little different. Of course no direct comparison is possible since it's not feasible to run a record/playback test on a play only transport. The spectrum analysis plot looks relatively benign, because the transport's sins are widely distributed rather than being concentrated into specific frequency bands. The signal/noise figures are pretty good.

SOUND QUALITY

Expectations for twin cassette decks at this end of the price spectrum are bound to be fairly modest, and in this context the Technics does well enough. One factor common to most of the listening was of a clear and articulate style of musical delivery, though tending to lack stereo depth and subtlety. The electronics are a little coloured, which affected all the listening to some degree. To give one example from a well known commercial recording, Tracy Chapman sounded quite well focused but unexpectedly distant and unexpressive, whilst the bass accompaniment lacked weight and extension. It was a wholly acceptable sound, but it could not be described as a high quality one.

Recordings made on and replayed by the *255* also lacked the exuberance and dynamic qualities present on the source. In a way, although it made workmanlike enough recordings, it was all rather anticlimatic. Metal tape recordings sounded brightest and most energetic, but there remained a loss of weight and 'grip', the music being diminished in subtle but important ways. Dolby processing didn't severely alter the picture, despite the response modifications already outlined.

Recordings made with Type II tapes like TDK *SA* sounded neutral and clean, and lower bias ferric tapes lent music a softer, gentler quality. But these changes were outweighed by the pervading lightness in the bass region. With some types of music it sounded thin and small. Dubbing performance was satisfactory when the dubs were made at normal speed – all pretence at hi-fi

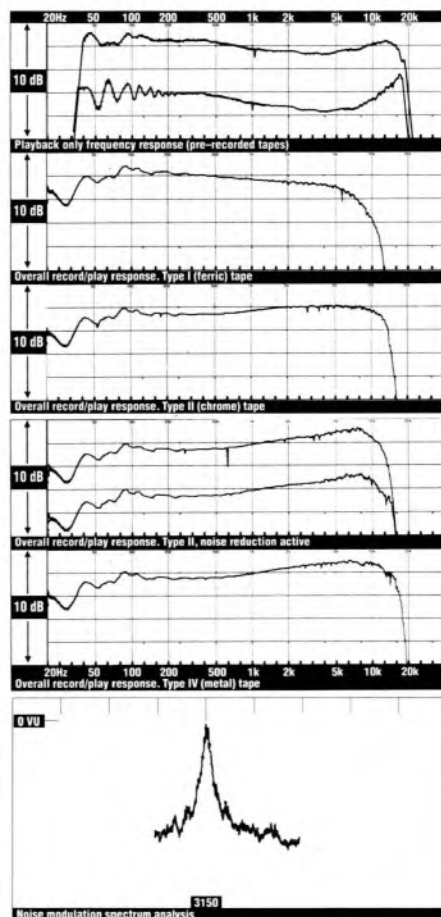
flies out of the window with recordings dubbed at high speed – but pitch integrity with sustained notes deteriorated.

CONCLUSIONS

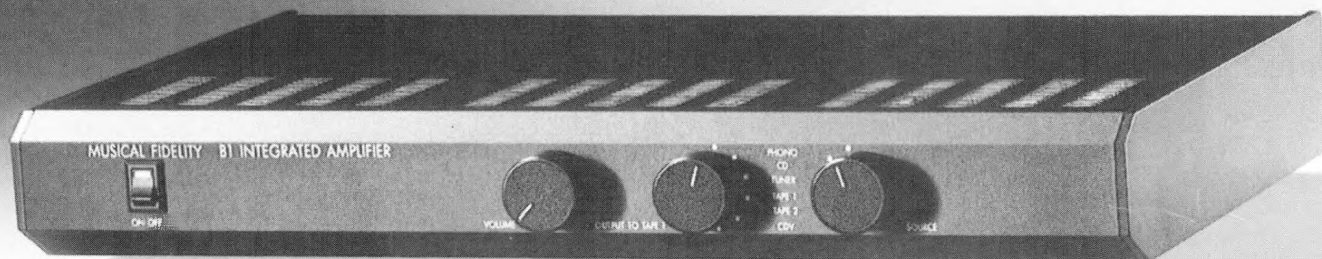
The *RS-TR255* makes a routine but viable Recommendation; it has more musical integrity than many at the price, and is sensibly presented too. At the same time, there's no doubt that better sounding recorders are available without spending more if only the user is willing to sacrifice the ability to dub tapes. I think the famous expression about horses for courses is applicable here.

TEST RESULTS

Dolby Level (on cassette deck meters)	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	30Hz – 9kHz
IEC Type II	30Hz – 14kHz
IEC Type IV	30Hz – 18kHz
Wow & Flutter – Peak DIN wtd/unwtd	0.13%/0.18%
Wow/Flutter Peak DIN wtd	0.1%/0.15%
Speed error	0.05%
Type I signal/noise CCIR/ARM 400Hz	52dB
distortion 0dB	0.65%
Type II signal/noise CCIR/ARM 400Hz	55dB
distortion 0dB	4.5%
Type IV signal/noise CCIR/ARM 400Hz	50dB
distortion 0dB	0.7%
Channel separation 0VU/1kHz	68dB
Line input sensitivity/overload	136mV/6.16V
Mic input sensitivity/overload	n/z
Line output for 0dB/maximum	630mV/2.4V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	0.06%
Azimuth check R-L phase at 10kHz	50°
VU indication at IEC 0dB	+3dB
Dimensions (w x h x d)	43 x 13.5 x 25cms
Typical retail price inc VAT	£159.95



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TECHNICS RS-TR355

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Due for release about the time this review appears on the bookstalls, the *RS-TR355* is another in a long line of twin transport decks from Technics which combines the distinctive and not unattractive blocky house style with a slightly odd blend of features. It is to be available dressed in black or silver.

Although only one of the two transports is capable of recording, both are kitted out with auto reverse mechanisms, allowing unattended dubbing of complete tapes (side A and side B), or even unattended recordings of a complete tape, which in practical terms means a maximum hands-off recording time of 90 minutes using a C90. Series playback is also enhanced by the presence of auto-reverse. With Technics' customary concern for user friendliness in the dual transport models, dubbing involves nothing more taxing than selecting the appropriate dubbing speed (1x or 2x) and pressing a key labelled 'synchro start'. The deck's electronics ensure that the supply tape is halted when the tape making the recording is stopped, say at the end of side. Equally, the record transport will drop into record/pause (after recording a four second blank) if the feed tape is halted or wound on for editing purposes. The *355* also offers a 'bar-room' mode, giving up to 24 hours continuous auto repeat, which ought to be enough even for the heaviest drinker - I mean thinker.

The transports themselves are pretty basic. They do not aspire to optical end of side direction change for example, but they are both instructed by well designed logic control panels which offer cue/review facilities. The loading door covers detach for cleaning. The deck is equipped with Dolby B and C (of course), Dolby HX Pro, twin electronic counters (lacking autostop, sadly, and a track or intro search facility) and dual range meters. The latter run from -20dB - +6dB or -3dB - +8dB in finer steps. Pioneer uses a similar arrangement, though it does do it much better. On balance I feel this feature is pointless and gimmicky.

LAB REPORT

The numbers are middling to poor, the flutter figure being especially poor. The broad central peak in the accompanying spectrum analysis provides mute confirmation of the trend, as well as showing some discrete wow

sidebands. The two transports were pretty consistent with each other.

The noise and distortion results (measured at 0VU, which is Dolby level) were moderate, but well behind the state of the art at this price. On the whole though, the various frequency responses gave plenty of cause for cheer. Head contour effects were minimal and bass output was smooth and well extended out to the limits of measurement (20Hz in fact).

However, it's worth noting that Dolby B and C led to a mild upwards tilt to the overall response curve, and that this is a real effect, a genuine translation caused by the Dolby circuits themselves. But the error was mild. Both playback response runs are shown, the record/playback transport providing the duller, more rounded extreme treble. In each case there's a minor loss of energy through the upper midband area followed by good treble extension.

SOUND QUALITY

In my view there's a major flaw with this deck: it's impossible to select auto reverse play followed by stop when the cycle has ended. You can select one side or auto repeat, which is a very special kind of lunacy. On the other hand, superfluous meter readouts aside, the display area is a model of its kind, and eases operation considerably.

Although the measured response looks rather odd, sound quality of prerecorded tapes was pretty good, especially on the record transport, though there were times where the slight high frequency 'edge' afforded by the latter was appreciated.

When making its own tapes, the Technics sounded clean through the midband, and it gave plenty of detail. But the bass sounded coloured and a little thin. There was little warmth or grace here, and crescendi sounded restrained.

Generally speaking, Type II tapes such as TDK SA performed in the same ballpark area as metals, effectively rendering the latter redundant. Largely, this is due to a general levelling down which left even metals sounding a little lifeless and lacking in real 'slam' and dynamics. Stereo imagery lacked depth and sharpness of lateral positioning. The noise reduction circuits are not of the quality found in many more expensive recorders,

and were themselves responsible for some loss of detail and presence.

CONCLUSIONS

The lack of a standard auto-reverse play mode is a potentially serious snag in my view, and I would gladly have swapped the pointless dual range meters (which are perfectly adequate in their standard mode) for a track search feature, which after all is genuinely useful. Sound quality is okay but a little unrefined for a deck at this price and specification level.

TEST RESULTS

Dolby Level (on cassette deck meters)

Deck I - +1.5dB/Deck II - +1dB

Rec/replay response - 3dB ref 1kHz

IEC Type I <20Hz - 13kHz
IEC Type II <20Hz - 16kHz
IEC Type IV <20Hz - 16kHz

Wow & Flutter - Peak DIN wtd/unwtd 0.15%/0.31%

Wow/Flutter Peak DIN wtd 0.10%/0.28%

Speed error +0.03%

Type I signal/noise CCIR/ARM 400Hz 48dB

distortion 0.7%

Type II signal/noise CCIR/ARM 400Hz 52dB

distortion 0.75%

Type IV signal/noise CCIR/ARM 400Hz 49dB

distortion 1.6%

Channel separation 0VU/1kHz n/a

Line input sensitivity/overload n/a

Mic input sensitivity/overload n/a

Line output for 0dB/maximum n/a

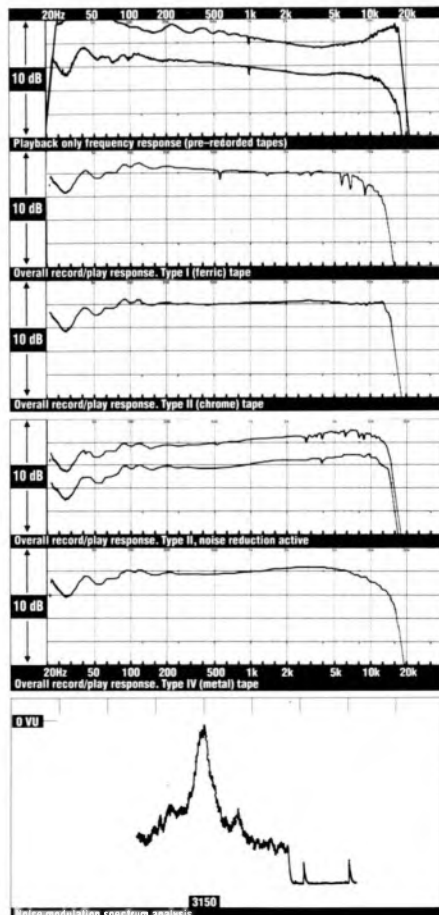
IM distortion 10kHz/1kHz 0dB peak, 1kHz product n/a

Azimuth check R-L phase at 10kHz n/a

VU indication at IEC 0dB n/a

Dimensions (w x h x d) 43 x 13.5 x 29cms

Typical retail price inc VAT £199.95



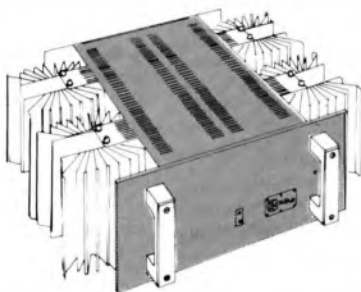
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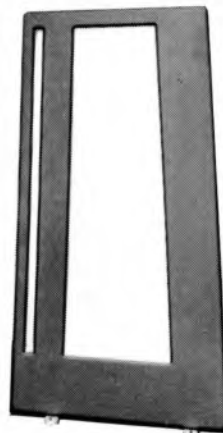
The most significant loudspeaker development must surely be the new Apogee Duetta Signature. We are all Apogee enthusiasts here but the improvement in sound quality with this model has amazed us. A true 'state of the art' product. Lower down the price range we must mention the new Magneplanar 1.4 which is a huge improvement in standards but amazingly costs no more than its predecessor at £1098. The P.S. Audio 4.6 with a new power supply is also a big improvement and at under a £1000 is probably the best pre-amp around at the price.



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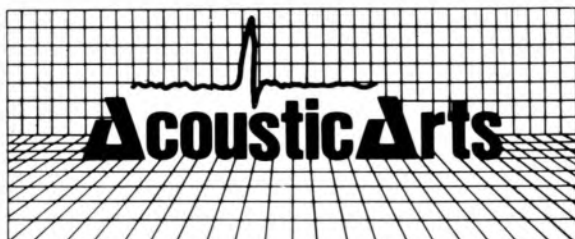


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YAMAHA KX-230

YAMAHA ELECTRONICS UK LTD., YAMAHA HOUSE, 200 RICKMANSWORTH ROAD, WATFORD, HERTS WD1 7JS. TEL: (0923) 33166.

RECOMMENDED



The *KX-230* is built into a strongly made box with an old fashioned overhanging fascia with rather sharp corners. It's built and finished well enough otherwise, though the design of the minor controls and associated panel graphics suggests a greater emphasis on style than on function. On the other hand the display area, with its six step 23dB meters, has little to do with style, though it is perfectly functional.

The specification level tells its own story, and the story is that the designers have done their homework. The *KX-230* is loaded, though not ostentatiously so. Aside from Dolby B and C, which are prerequisites nowadays, the Yamaha has Dolby HX Pro headroom extension circuitry, a manual bias adjust feature (operative with all three tape types) and a powerful selection of tape search aids. Surprisingly perhaps, the *KX-230* has only a plain mechanical tape counter and no memory stop, but it more than makes up for this with a bi-directional intro scan, next/current track search, phrase and side repeat. The intro scan feature is particularly attractive as Yamaha has gone to the extent of fitting dedicated search keys, one for each direction.

These things aside, our story is a simple one. You get a headphone socket but nothing for microphones and a cassette compartment with a detachable cover to allow access to the heads and guides for cleaning. Unusually, especially at this price level, the *KX-230* is fitted with an infra-red receiver. Probably to help Yamaha hit price points, the remote control handset (the *RS-K3*) isn't supplied with the recorder, but as an optional £20 extra. A bit steep? Yes that's what I thought too...

LAB REPORT

The replay only response is absolutely flat, aside that is from a kicked up low frequency region amounting to just over 2dB between 50-60Hz. Caused by excessive equalisation, the effect is cancelled out of the record/replay response runs which are flat in the bass, although loss of output below about 50Hz is rapid.

All of the record/replay frequency responses are bright at the standard (central) setting of the bias control. Varying record bias helps flatten the upturned

curves, but again the effect shown in the plots has more to do with equalisation than bias, and the Yamaha doesn't quite match standard IEC test tapes as set up by the factory. Nevertheless, the plots are all quite smooth and well extended. The even sharper lift with Dolby (especially Dolby C) is mainly due to the way these circuits magnify existing amplitude errors.

Spectrum analysis suggests that Yamaha's two motor transport has no dominant pattern of pitch instability, and although the wow and flutter figures are no better than moderate, (in fact the combined weighted figure is a little below par) there's little obviously wrong for the ear/brain to latch on to.

Note that 0VU distortion levels are beginning to rise, and that the respectable signal/noise figures are therefore slightly offset by the limited HF headroom.

SOUND QUALITY

The obvious points to watch with the Yamaha are to avoid over recording - straying far into the red area above 0VU - and to adjust the bias control for your chosen tape type by comparing the source and recorded sound (use FM interstation hiss if you find it hard to judge with music). It's all obvious really. The test sample supplied made some intermittent ticking noises from the direction of the tape counter, with an indeterminate but probably negligible effect on the music. This apart the Yamaha performs well for the price.

Although the measured effect was quite small, the raised level of low frequencies with prerecorded material was extremely obvious on audition where the bass often tended towards a rather loose, warm quality lacking in specific focus or any strong sense of purpose during driving passages for orchestral cellos for example. However, the slightly detached bass quality was much reduced when playing back its own recordings where the Yamaha impressed as much for its homogeneity as its clarity and clear stereo sense. Dynamic range was slightly hampered by the inability to accept high levels without obvious audible signs of strain, but high frequency headroom was a little better than expected, almost certainly due to the action of the Dolby HX Pro circuit.

The *230* is a borderline case for metal tapes. Owners may like to experiment, but

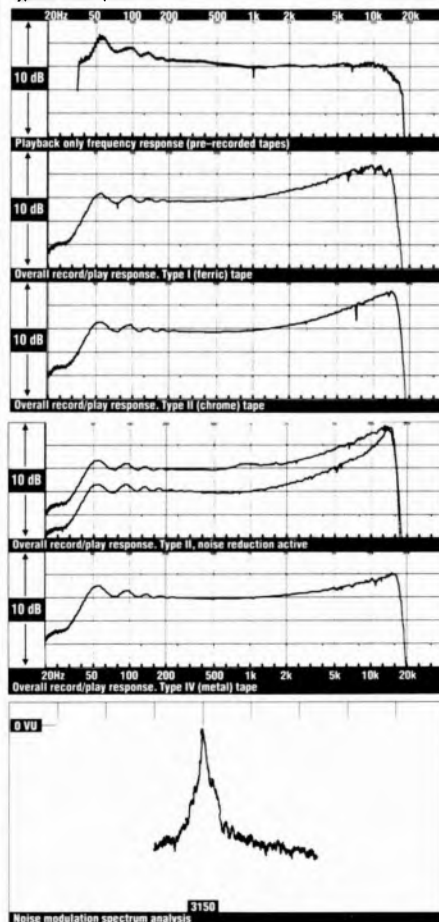
will probably be happier with a good Type II for most of the time. There is no doubt however, that the Yamaha's Dolby C installation causes a slight deadening effect on music reproduction.

CONCLUSIONS

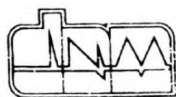
The Yamaha misses Best Buy rating by a relatively small margin, and then because of a lack of star quality than because of any real failing. This is a good if slightly dated looking deck, with modest ergonomic failings, some excellent search facilities and a high standard of musical competence.

TEST RESULTS

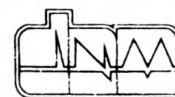
Dolby Level (on cassette deck meters)	0dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	33Hz - 16kHz
IEC Type II	33Hz - 18kHz
IEC Type IV	33Hz - 19kHz
Wow & Flutter - Peak DIN wtd/unwtd	0.12%/0.15%
Wow/Flutter Peak DIN wtd	0.08%/0.10%
Speed error	+1.01%
Type I signal/noise CCIR/ARM 400Hz	48dB
distortion 0dB	1.5%
Type II signal/noise CCIR/ARM 400Hz	54dB
distortion 0dB	1.3%
Type IV signal/noise CCIR/ARM 400Hz	49dB
distortion 0dB	0.9%
Channel separation 0VU/1kHz	75dB
Line input sensitivity/overload	88mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	590mV/3.8V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.8%
Azimuth check R-L phase at 10kHz	80°
VU indication at IEC 0dB	+8dB
Dimensions (w x h x d)	43.5 x 11 x 27.5cm
Typical retail price inc VAT	£139.95



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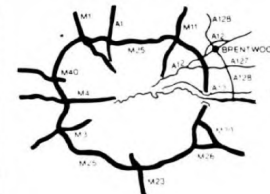
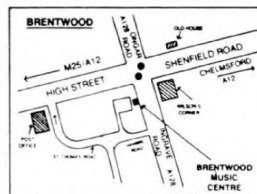
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TECH TALK

Alvin Gold describes the how and why of the various technical tests.

The true value of any *Hi-Fi Choice* project derives from covering a wide enough range of equipment to be fully representative of the market as a whole, and in reporting on them using common techniques and criteria, so that once the reader has learned to interpret the author's personal idiosyncrasies and prejudices, he can apply this knowledge to a large database of review information.

At the outset let me acknowledge the help I received from various sources: James Michael Hughes, an able assistant who did much of the basic measurement work; Chris Bryant, who did the sensitivity, overload, azimuth, intermodulation and VU indication at IEC 0dB measurements. All the remaining machine tests and most of the tape tests were done using the author's own facilities.

As in previous projects, the cassette decks were assessed in two distinct ways: first as hardware designed to play commercially recorded musicassettes, and secondly as recording tools. The vital distinction is that for the former the deck must correspond (in physical alignment and electrical equalisation) to the external standards applied during the duplication of prerecorded material. In the latter case, this stricture doesn't apply in quite the same way. Although a recorded tape ought still to replay accurately on other cassette decks (the owner's *Walkman* or ICE players, for example) some of the commonest errors (notably those due to head alignment) are essentially self-correcting with the same machine; they replay with the same error that was used at the record stage.

LAB TESTING

Dolby Level. Dolby level 20nW/mm as indicated on cassette deck meters, using Teac test tape. Note limited resolution of some meters can give reading errors.

Rec/replay response – 3dB ref 1kHz. The two figures given

are simply the –3dB frequency extremes that define the bandwidth (referred to the arbitrary 0dB 1kHz level, and recorded at –10dB ref IEC). These are shown separately for all three tape types.

Wow and Flutter – Peak DIN wtd/unweighted. Central to the task of writing to and reading from tape is that the consequence of any lack of absolute speed stability will superimpose itself on the signal, and that you will hear the effect. In an analogue system like compact cassette, the inevitable variations in speed of the tape passing over the heads appear as momentary (and sometimes longer term) pitch variations. This class of variation is known under the blanket term wow and flutter, and is shown in unweighted and weighted form. Wow and flutter are also shown separately.

Speed error is measured in percentage deviation from the nominal standard (4.75cms/s). The accuracy of this test has been improved for this issue.

Signal/noise ratios are quoted with CCIR/ARM weighting. The test frequency is 400Hz, the distortion is shown at the same point (0VU on the deck's meters) for each of the three tape types.

Channel separation is measured with reference to a 1kHz signal at 0VU on the deck's meters. The accuracy of this test has been improved for this issue.

Line input sensitivity/overload. Will it match your amplifier tape feed?

Mic input sensitivity/overload. What sort of microphones (if any) can be used?

Line output for 0dB/maximum. Will it drive your amplifier properly? (Probably.)

IM distortion 10kHz 11kHz 0dB peak, 1kHz product. This test gives a useful measure of how well or badly the various machines respond when asked to record two high frequency signals at 0VU level simultaneously. Real life musical signals are much more complex still of course, and an inability to

deal with this test cleanly suggests an inability to cope with up-front percussion or other high energy material without sounding hard, splattery or just plain distorted.

Azimuth check R-L phase at 10kHz. Expressed in degrees (of treble phase shift), this is a measure of azimuth misalignment. The higher the error, the greater the HF loss when playing commercially recorded cassettes.

VU indication at IEC 0dB. In principle, the 0VU point on a deck's record level meters is arbitrary, but it is usually set around +3dB ref IEC 0dB.

Dimensions (w x h x d). In centimetres, of course.

PLOTS & GRAPHS

In addition, a number of plots and graphs are included with each review. The frequency response plots were run with the highest pen writing speed available, which means that dropouts tend to show up in all their glory, and frequency response errors are not 'sanitised' as is often the case. The chart recorder was used with its greatest vertical resolution. This exaggerates response aberrations by a factor of 2.5 times compared to previous cassette deck tests but brings them into line with CD players, cartridges and amplifiers. The record/replay sweeps were also continued right up to 40kHz. All response plots were run at –10dB, which stresses the machines rather more than the traditional –20dB.

Also included are similar, comparable plots showing the effects of the noise reduction systems in the frequency domain. The playback only plots were also run in exactly the same way, giving an indication of the frequency response available with prerecorded material. For this issue, thanks to Sony and Pioneer, we were able to run this test with official IEC 120µS replay sweep test tapes from ABEX. The tapes used were TCC-162B (20Hz to 18kHz) and TCC-162 (31.5-18kHz).

We also performed spectrum analysis tests to investigate the mechanical behaviour of each of the decks, though space prevented the publication of more than one of these. The noise modulation spectrogram graphically illustrates the mauling endured by a 3150Hz sinewave when recorded and replayed by the deck under test – there are close parallels with a similar analysis carried out in last year's edition. The central peak should be as fine and as thin as possible, any problem here being heard as a lack of pitch stability.

Response runs were also made using the high speed dub option, but have not been reproduced for space reasons. With auto-reverse decks, all data refers to Side 1, but the reverse side was checked in the same way, and again discrepancies are reported as they arose. In the case of decks with automatic tape alignment, the alignment procedure was followed, and where a bias adjustment facility was fitted, the setting recommended for TDK, AD, SA and MA was used if available. Otherwise the central setting was adopted.

LISTENING TESTS

The listening was divided into two sections. The first involved using each deck in turn in a system which included a Marantz *CD12/DA12* CD player, QED *A270* amplifier, a pair of Stax *Lambda* headphones and Tannoy *DC3000* loudspeakers. Much routine listening was done with this system, along with all the functional work – which button does what and so on.

Finally, and most important of all, each deck was auditioned in a high grade loudspeaker based system. Equipment used included DNM and Pink Triangle preamplifiers, Musical Fidelity *A370/II* and Krell *KSA-200* power amplifiers, a Roksan/*Artemiz/Shiraz* record player, the Marantz CD player already mentioned and Apogee *Caliper Signature* loudspeakers, all wired with solid core cable from DNM and Mission.

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CASSETTE DECKS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Alvin Gold makes up his mind about this month's batch of decks; plus we include our features comparison chart on 60 models.

Amongst other things, 1989 is the year that DAT didn't happen – again. For the second year the non-Japanese software industry has held out against the Japanese dominated hardware producers as protectionism runs rife. But industry discussions have been going on behind the scenes, and there's a possibility, perhaps quite a good one, that DAT will be given the green light for a relaunch as a domestic system, mostly likely during the course of 1990. Almost certainly it will be hamstrung with *Solocopy* or a variant which will seek to inhibit the misuse of DAT as a means of pirating copyright material. (*Absolutely! See this month's Update for the latest news – Ed.*)

At the time of writing however DAT remains the biggest (and costliest) non-event ever (not) to have happened to the audio electronics industry, and the consequences are reverberating still. Quite what will happen next year if and when DAT is relaunched I simply don't know. But one very likely possibility, and this is the nightmare scenario that haunts many electronics companies, is that DAT is now too badly mauled by recent (non) events to have any significant impact in the foreseeable future – or at all. One thing however is for sure. Manufacturers will not be gearing up for a CD style mass market as they once were, and the effect of this is that prices for DAT will remain high. Almost certainly too high for most people.

Meanwhile, the poor befuddled punter is reaping some

unexpected benefits from the confusion as high powered but underemployed DAT engineers are put back to work designing cassette decks. We catalogued this trend last time we looked at the genre in April's *Choice*. The point made then is reiterated now: cassette decks have been improving steadily in performance over the last year or so, following a very long and complacent period during which the industry spent its time treading water. The improvements that we are seeing are not due to any fundamental advances, but to a process of chipping away at the small problems, often conceptual, that afflict the technology. As an example, once one manufacturer had realised the advantages of clamping a DAT cassette housing firmly whilst it was playing, someone had the bright idea of trying the same trick with analogue cassettes.

Now they're all sprouting cassette clamps, not always very effective ones, and at best with an indeterminate effect on sound quality. But at least the thinking that lies behind it is positive. By next year we'll be seeing some new developments from Dolby Laboratories, and speaking personally I'm looking forward to some continued chipping away at the small, easily overlooked areas. These include the ability to douse fluorescent displays (this is something that came from the world of compact disc, and has yet to be taken seriously by most cassette deck manufacturers) and to defeat Dolby HX Pro processing. Sadly, none of the predominantly

middle class, middle market cassette decks submitted for this test had either of these last two features.

Even so, some impressive products were submitted this time, which is duly recognised in the proportionately greater number of Best Buys and Recommendations in this test than in the recent past.

TWIN TRANSPORTS

Let's start with the twin transport models. As a group, they were clustered towards the bottom of the price range covered by the group as a whole, and as another purely personal note I find the absence of well engineered twin transport models without the usual compromises – at higher prices of course – wholly deplorable. I can well understand the attraction of dual decks, but I cannot understand why the idea of a really high quality dual model seems to be so foreign to so many producers.

Even in the price range that's covered in this issue, very few of the twins really make the grade as respectable audio performers. What we have at the end of the project is a select little group of just three models for commendation, just one of which achieves Best Buy status. This is the **Aiwa AD-WX777**, costing £179. This is an impressively turned out (and physically rather large) design featuring two logic controlled optically triggered auto-reverse transports with some decidedly un-twin deck like features: cassette shell clamping and separate bias pots for ferric and chrome tapes, for example, though there's no bias

adjustment for metals. About the only substantive criticism to emerge from the listening tests was a degree of brightness with prerecorded tapes. Pricing is nothing short of predatory . . .

The two Recommended twin transport models flank the Aiwa on price. First, at £159.95, is the **Technics RS-TR255**, an attractively presented design with unidirectional transports. It doesn't have quite the star quality of some older Technics twins, but it is a product of integrity and is quite respectable on audition. Our other recommendation is for another **Aiwa**, the **AD-WX888**, which costs £249. Superficially this deck appears to be very similar to the **AD-WX888**; it differs mostly in having better displays and better heads. They sound rather different however, and although the dearer model has a wider effective dynamic range, the transport appears to be identical. The bottom line is that the **AD-WX888** looks less convincing in value for money terms, even though it's absolute standard of reproduction is better.

THE MAINSTREAM

From here we move to the mainstream single transport players, which we'll cover in ascending price order. You can't get much lower than £99 of course, a sum that buys you a small, lightweight machine from **Aiwa**, the **AD-F270** – Best Buy. This is very basic engineering indeed, but not so basic that it doesn't offer a fine bias adjust feature (inoperative on metals) and Dolby C. It's also not too basic a model to work in a

Rotel's RD-865 sounds good, and Aiwa's AD-WX777 is a great value twin deck.



worthwhile way.

Our next commendation goes to a model from the Teac stable – the **Teac V-480** (£129, Recommended). Like the aforementioned Aiwa, the Teac is pretty basic stuff, but you do get the benefit of Dolby HX Pro, plus fine bias adjust and Dolby C. Again, it's a neatly laid out deck in a low key way, and should prove very easy to use once the vagaries of the meters have been mastered.

From here on, we're moving into slightly more ambitious territory. The **Yamaha KX-230** (£129.95, Recommended) for example adds a range of quite powerful tape search aids to a fairly simple but more than adequate basic design. Again pricing is a strength. Somewhere around this general price area, good quality audio gives way to products that can be legitimately described as high fidelity, though where the line is actually drawn remains as elusive as a good working definition of high fidelity itself.

Our next model is from **Sony** and is called the **TC-RX55** (£149.95, Recommended). It's definitely hi-fi, and it's also auto-reverse, with such added refinements as high grade heads and Dolby HX Pro, Sony being a relatively late convert to this system. The **TC-RX55** is a good looking, well made design.

Better still, if you're willing to forgo the auto-reverse facility, Denon has introduced a couple of new models (with more to come) including a truly excellent semi-budget design called the **Denon DRM-500** (£169.95, Best Buy). The range of features is far from being as extensive as some at the price, but this is also its strength: more resources have gone into essentials like the excellent transport, and I can see this deck becoming a favourite with specialist dealers as an adjunct to high grade vinyl or CD based systems.

Our next model achieves Best Buy status too. The **£200 Rotel RD-865** is a long awaited design, incorporating the fruits of its purist **BX** series amplifier technology. Like the **Denon DRM-500**, which is a logical competitor, the Rotel is relatively under-endowed, but the increased resources expended on the bits that actually affect the sound pay the expected dividends. This is a classy sounding design, largely it seems due to the strengths of the electronics since the transport is unremarkable.

There are two designs worthy of special note around **£250**. The first is another Best Buy – the

£249 Aiwa AD-F800. A high grade unidirectional deck, it features a sophisticated dual capstan transport with three heads and off-tape monitoring. A rudimentary tape calibration system is included, and performance is fully in line with price, particularly in areas like dynamics and resolution. Also Recommended is the **Pioneer CT-656** (£249.90) which has many similarities to the Aiwa, though it lacks the latter's record sensitivity adjustment. However, it's a finely engineered design and well worth the money.

At the next price point upwards, the **Denon DRM-800** (£299) also achieved Recommendation. In broad outline this deck has a similar specification level to the Pioneer and the Aiwa, and includes several minor refinements they don't have. There are a couple of criticisms to be made too. In contrast to its predecessor, there is no record sensitivity pot to help ensure good Dolby tracking. And in common with the **DRM-500** there's no timer standby feature. The standard of music reproduction achieved by the Denon, however, is extremely high.

For our final two recommendations we move onto much higher price levels. The first of these is the **£499.90 Pioneer CT-91a** (Recommended), Pioneer's glossily presented 'cherished number' model being a masterpiece in many ways, offering the silky user interface of a top class CD player (or DAT recorder) and very sophisticated transport and electronics. A lot of thought and careful development has gone into this model, which if anything appears underpriced, even at **£500**.

Finally, there are the more classical charms of the **Revox B215-S** (£1,481, Recommended). This too is a subtle and involving deck, blessed with one of the sweetest and smoothest transports it has ever been my pleasure to use. The Revox is built to the very highest standards inside, albeit in a slightly old fashioned way, and will probably hold its value better than most. The range and style of features offered is quite individual (eg optional Type II/120µS recording, the ability to align bias and sensitivity and store two such settings in the Type I and II memories, etc), and it is biased towards ease of use whilst allowing any potentially restrictive automated feature to be bypassed. Only ergonomics turn out to be the poor relation in this recorder.

	Single deck	Dual deck/ single record	Dual deck/ dual record	High speed dub	Real-time counter	Counter memory
Aiwa AD-F270	●					
Aiwa AD-WX777		●		●		
Aiwa AD-F700	●					●
Aiwa AD-F800	●					●
Aiwa AD-WX888		●		●		
Denon DRM-500	●					●
Denon DRM-800	●				●	●
Kenwood KX-3010	●				●	●
Kenwood KX-9010	●				●	●
Pioneer CT-656	●				●	
Pioneer CT-737 Mk II	●				●	●
Pioneer CT-91a	●				●	●
Revox B215-S	●				●	●
Rotel RD-865	●					●
Sony TC-FX110	●					
Sony TC-RX55	●					●
Teac V-285CHX	●					
Teac W-355	●	●		●		
Teac V-480	●					
Teac W-450R		●		●		
Teac W470		●		●		
Teac R-919X	●				●	●
Technics RS-TR255		●		●		
Technics RS-TR355		●		●		
Yamaha KX-230	●					

Aiwa AD-R470	●					
Aiwa AD-WX909		●		●		
Aiwa XK-009 Excelia	●				●	●
Akai CX-95	●				●	●
Akai CX-52	●				●	●
Akai CX-6	●				●	
Denon DR-M12HX	●					●
Denon DR-M24HX	●					●
Denon DRW-750		●		●		●
Dual CC8010	●					
Harman Kardon CD491	●				●	●
Kenwood KX-5010	●				●	
Marantz SD-35	●					
Marantz SD-45II	●					●
Marantz CP230	●					●
Marantz SD-55	●				●	●
Memorex SCT-84		●		●		
NAD 6300	●				●	
Nakamichi CR-2E	●					●
Nakamichi CR-5E	●					●
Nakamichi RX-202E	●					●
Nakamichi CR-3E	●					●
Nakamichi CR-4E	●					●
Nakamichi CR-7E	●				●	●
Onkyo TA-2120	●					
Sansui DX301i	●			●		●
Sony (WMD6C) ProWalkman	●					
Sony TC-RX80ES	●				●	●
Teac V-250	●					
Teac V-870	●				●	●
Teac V-970X	●				●	●
Teac W-990RX			●	●		
Technics RS-B355	●					
Yamaha KX-400	●					
Yamaha KX-500	●				●	●

† Wire link connections for Denon systems

‡ See text

Cpt. Optional

FACILITIES CHART

Auto reverse play	Auto reverse record	Track (music) search	Dolby C	dbx	Dolby HX Pro	Auto tape sensing	Tape alignment adjust	Tape azimuth adjust	Record bias adjust	Remote control	Auto repeat	Microphone Input	Headphone Output
			•			•			•				• Aiwa AD-F270
•	•		•			•			•				• Aiwa AD-WX777
			•		•	•			•				• Aiwa AD-F700
			•		•	•	•		•				• Aiwa AD-F800
•	•		•		•	•			•		•		• Aiwa AD-WX888
		•	•		•	•			•				• Denon DRM-500
		•	•		•	•			•				• Denon DRM-800
		•	•		•	•	•		•		•		• Kenwood KX-3010
		•	•		•	•	•		•	•	•	•	• Kenwood KX-9010
		•	•		•	•			•		•		• Pioneer CT-656
		•	•		•	•	•		•				• Pioneer CT-737 Mk II
		•	•		•	•	•		•				• Pioneer CT-91a
		•	•		•	•	•		•	Opt.			• Revox B215-S
		•	•		•	•			•		•		• Rotel RD-865
		•	•		•	•			•				• Sony TC-FX110
•	•		•		•	•			•	Opt.	•	•	• Sony TC-RX55
			•						•				• Teac V-285CHX
			•			‡							• Teac W-355
			•		•	•			•				• Teac V-480
•	•	•	•		•	•						•	• Teac W-450R
			•		•	•							• Teac W470
•	•	•	•	•	•	•	•		•		•		• Teac R-919X
•	•		•			•					•		• Technics RS-TR255
•	•		•		•	•					•		• Technics RS-TR355
		•	•		•	•			•	Opt.	•		• Yamaha KX-230

RECOMMENDED MODELS FROM PREVIOUS TESTS

•	•		•		•	•			•				• Aiwa AD-R470
•		•	•		•	•			•		•		• Aiwa AD-WX909
			•	•	•	•	•		•		•		• Aiwa XK-009 Excelsia
			•		•	•	•	•	•	•	•		• Akai GX-95
•			•		•	•			•	•	•		• Akai GX-52
			•		•	•			•				• Akai GX-6
			•		•	•			•				• Denon DR-M12HX
			•		•	•			•				• Denon DR-M24HX
			•		•	•			•	‡			• Denon DRW-750
			•									•	• Dual CC8010
			•		•				•		•	•	• Harman Kardon CD491
			•		•	•	•					•	• Kenwood KX-5010
			•			•			•				• Marantz SD-35
			•			•			•				• Marantz SD-45II
			•			•			•		•	•	• Marantz CP230
		•	•		•	•			•		•	•	• Marantz SD-55
•	•		•		•	•			•		•	•	• Memorex SCT-84
			•		•				•	•			• NAD 6300
			•			•			•	•	•		• Nakamichi CR-2E
			•			•			•		•		• Nakamichi CR-5E
•	•		•			•			•		•		• Nakamichi RX-202E
			•			•			•	•	•		• Nakamichi CR-3E
			•			•			•	•	•		• Nakamichi CR-4E
			•			•	•	•	•	•	•		• Nakamichi CR-7E
			•			•			•		•		• Onkyo TA-2120
		•	•		•	•			•		•		• Sansui DX301i
			•									•	• Sony (WMD6C) ProWalkman
•	•	•	•		•	•	•		•				• Sony TC-RX80ES
			•		•	•							• Teac V-250
			•		•	•							• Teac V-870
		•	•	•	•	•			•	•	•		• Teac V-970X
•	•	•	•	•		•			•	•	•		• Teac W-990RX
			•									•	• Technics RS-B355
•	•	•	•		•	•			•	•	•		• Yamaha KX-400
			•		•	•		•	•	•	•		• Yamaha KX-500

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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.

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CHOOSING AND USING . . . HEADPHONES

Jason Kennedy details the listening tests and outlines some of the points to consider when selecting 'ear goggles'.

Back in the spring we scheduled a batch of twenty headphone reviews for this issue. Had yours truly realised that the summer was going to be as hot as it turned out to be we might have postponed it until more temperate weather arrived. But as it turned out I learned the warm way about which headphones make the best ear muffs.

As if that wasn't enough this particular review project had a record amount of failures, and not only amongst the headphones. QED recently launched a range of mini amplifiers which includes, you guessed it, a dedicated headphone amp. Using a 12 volt adaptor and a tape output you've got what should be a half decent dynamic headphone driver with two outlets. Just the job methinks. That was until after about an hour into the testing it developed a hum, and had to be abandoned in favour of the next best thing available – a Nikko tape deck! But this served its purpose and reviewing could continue. (The show must go on, etc . . .) We later found a Hafler preamp with its own headphone socket so that was pressed into service as a check and a source for latecomers – of which there were, and always are, a good few.

The important factors to consider when buying headphones are primarily sound quality and comfort, though the latter is perhaps the more important. A pair of 'phones may sound great on first impression but if they become uncomfortable after a while one is unlikely to carry on wearing them. Comfort to a large extent is related to the size of the head and ears. There are quite a few ostensibly circumaural headphones, ie with ear pads that rest on the side of the head, such as the more expensive Beyers or Quarts that aren't really large enough to avoid pressing on some part of the ear, especially if your shell-likes aren't all that shell like. Some



circumaurals create problems with pressure but this is more obvious with supra-aural designs, those which press on the ear itself and which are more predominant at the budget end of the market. However, if your head is of average or more width many supra-aurals tend to press rather hard and prove ear bending after little more than five minutes.

Our comfort ratings are based on the collected opinions of the *Hi-Fi Choice* comfort crew, made up of both sexes and a good variety of ear sizes, therefore the higher rated 'phones are those that felt good on everyone. There was definitely a difference of opinion on some models though, so make sure you try before you buy even if you can't listen.

As far as sound quality is concerned, very few models exhibited a flat, neutral response

when listened to through the reference system and compared with the magnificent Stax *Lambda Pros*, so it's sensible to find a 'phone which will balance any weaknesses in the system with which they will be used. For instance, if you find your system a little aggressive or bright then a warm sounding headphone will probably work quite well. When matching headphones to an amplifier consider the sensitivity of the 'phone and how it relates to the gain range available. Some 'Walkman' oriented models proved very sensitive to the hum on the headphone sockets of several amplifiers. At the opposite extreme some cassette decks have quite low outputs at their headphone sockets which may prove a minor problem with some inefficient models. As ever, the rule is to try the required combination out for yourself.

The set up used for the listening tests consisted of Roksan *Xerxes/RB300*/van den Hul *MC One* and Systemdek/SME *IV/Goldring G1020* turntables, Marantz *CD75/ISE* disc player and the aforementioned Hafler *110A* and Audio Innovations *Series 1000* preamplifiers. Interconnects, where used, were Audio Note and Quantum.

Source material on vinyl included Abdullah Ibrahim's excellent *Ekaya* – African jazz featuring a track which formed the basis of the *Betty Blue* film soundtrack, Lou Reed's intricate and involving *New York* and a 1954 gem from Thelonius Monk and Sonny Rollins. On silver disc a copy of the single *Thrill Has Gone* by Texas was used as well as several Stax dummy head recordings, a series of CDs recorded specifically for headphone listening. The ones we had to hand included the weird *Space Sound* CD as well as more natural sounds in the form of Baroque concertos.

A trend which was evolving on the first test was the fitting of dual sized jack plugs, a 3.5mm plug fitted to the cable with a standard 6.3mm one screwing or pushing over the top. This time around they were a lot more prevalent, a result no doubt of the increasing popularity of better quality personal stereos and portable CD players. Another area of development that follows in the footsteps of domestic audio is the use of better quality cables – virtually all the Japanese 'phones encountered had adopted oxygen free copper cables. This undoubtedly has something to do with the above average standards that they achieved.

In order to make space for more juicy pieces in the magazine's Front End we've abandoned the usual Conclusions page and instead would point readers towards the *Directory* at the back of the issue where they can find potted summaries of the headphones from this and the last test.

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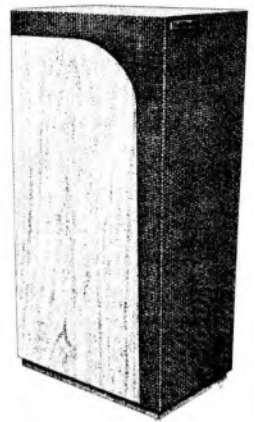
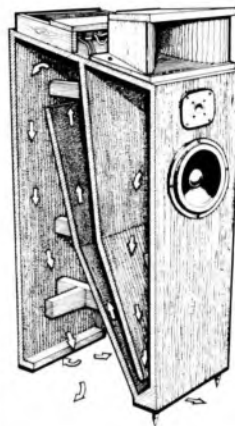
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AIWA HP-X30

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DRIVE, WEST DRAYTON, MIDDX UB7 0LY. TEL: (01) 897 7000.



Probably because Aiwa produces so many personal cassette players it has a wide range of headphones specifically oriented to this type of use. The £30 *HP-X30* is one such headphone, and fitted with small closed back phones it's highly suited to life in the great outdoors.

In construction the *X30* is much like other upmarket personal stereo phones; stainless adjusters slide into a short padded headstrap and connect to longish side pieces. These are attached to the yokes with flexible links that allow movement in both lateral and vertical planes so that the earpads sit at the correct angle on the ears. In a completely contrary fashion to the big Sony *CD999s* the headband is angled back from the phones, so that it rests on the crown of the head. This wouldn't seem to be such a great system, but they don't fall off, or feel as though they might. However, you may have different feelings so try them for yourself.

With an analogue source the *X30s* got off to a poor start, sounding rather basic and giving the impression of being thick and veiled. However, further listening revealed a fairly distinctive low frequency hump in the perceived frequency response which had a masking effect with some material but enhanced other

records. The 1950's jazz recording came off quite badly and revealed the findings mentioned above, but more recent and admittedly more electric recordings sounded relatively appealing. The Peter Case track came across in a clean and fresh manner whilst Tracy Chapman, although obviously sonically coloured, retained a musical pertinence that encouraged continued listening.

With CD the bass boost effect was even more noticeable. The classical tracks sounded quite odd, with the Stax disc coming on in an even more depressing fashion than it usually does. On the whole though, the *X30s* fared better with silver discs, managing to sound quite detailed and, dare I say it, musical.

Whilst not really in the recommendable class, Aiwa's *HP-X30* is a reasonably competent and comfortable headphone that is only excelled by a few at its price.

GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	140g
Size rating	small
Length of cord	2.3m, dual jack
Comfort rating	good
Sound quality rating	good—
Price	£30

AIWA HP-X80

AIWA (UK) LTD., UNIT 5, HEATHROW SUMMIT CENTRE, SKYPORT

DRIVE, WEST DRAYTON, MIDDX UB7 0LY. TEL: (01) 897 7000.



In our last headphone review we tested the Aiwa *HP-X8*, a neat little pair of cans that were both comfortable and good sounding. A year later that model has been superseded by the *HP-X80*, which is a conventional design more suited to personal stereos. However, it does claim one novelty in the form of a carbon fibre disc diaphragm. As far as can be seen this is merely a carbon fibre patch stuck over the normal diaphragm, but cans are tricky things to get into and there may be more to it than meets the eye.

Structurally, the *HP-X80* is very similar to the *HP-X30*, with one important exception and several minor ones. The major one is that the headband doesn't lean back from the phones but remains at a more conventional angle, making them more secure if not more comfortable. In fact because of the extra pressure exerted on the ears by the *X80*, long term comfort is somewhat compromised. Why they should have such a vice like grip on one's lobes is not immediately obvious, but perhaps they have been specially tailored for joggers or even gymnasts.

Sonically, the *HP-X80s* have a definite character of their own, and with some material, notably classical, this has rather dramatic and unappealing effects.

However, the majority of the test music sounded quite convincing, but then again the majority of it was electric with the exception of vocals. The one acoustic track featured Sonny Rollins' saxophone which sounded slightly 'cardboardy', but lively and musically involving at the same time.

The other material on vinyl worked nicely with good instrumental separation and appealing shape and depth to bass lines. In some ways the solid balance of the *X80* was more musically involving than the transparency of the reference. But such 'less is more' musicalityisms are not really where we're at here at *Choice*. What we want is fidelity, but unfortunately that's rather uncommon and with personal stereos it's not even desirable.

At the end of the day we have a headphone that's highly suited to non-acoustic music and portable sources. They would be preferable if physical ear pressure were lower but if this doesn't bother you then give them a spin.

GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	140g
Size rating	medium
Length of cord	3m coiled, dual jack
Comfort rating	good
Sound quality rating	good
Price	£50

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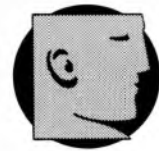
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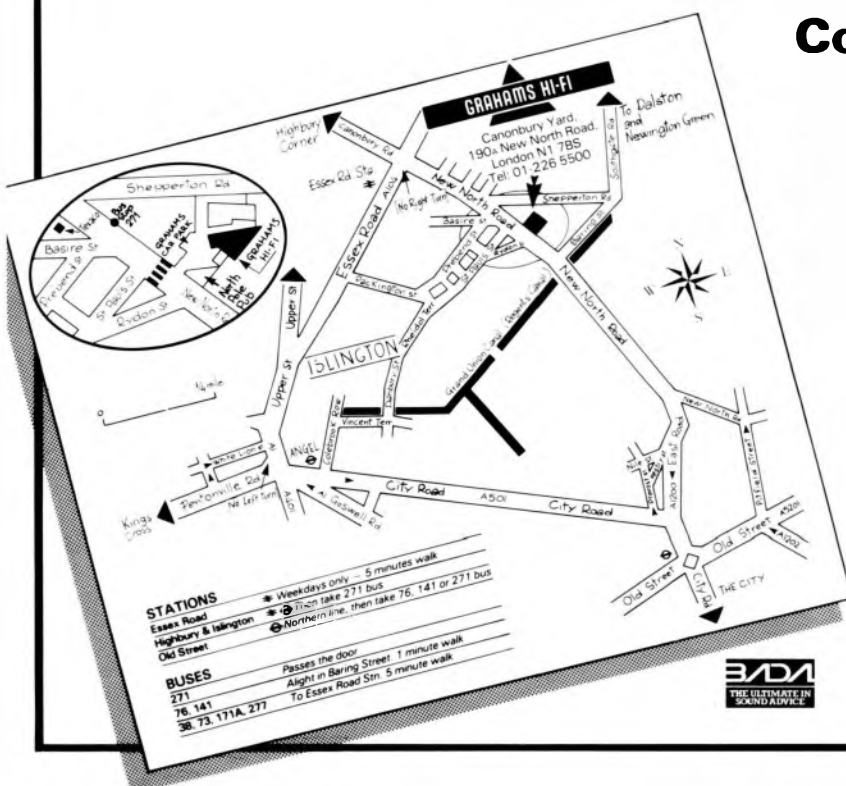


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By far the most popular headphone used with *Walkmans* these days seem to be tiny in-ear jobbies and although they don't sound a great deal better than their strapped alternatives, they are considerably more discreet. As personal stereos are street-oriented objects, anything that represents an aesthetic improvement is likely to be a hit.

Aiwa's *HP-V99s* are an attempt at producing in-ear phones with hi-fi sound quality, and given the hefty £50 price tag one would expect a fair degree of success. There are, of course, a variety of claimed performance improving aspects incorporated into them, including an LC-OFC connection cord and 60mm bass resonator ducts! Although this sounds like sales talk, it appears to be a horn like system which uses a 'U'-shaped tube to extend the bass response.

The 'bass resonator ducts' are the gold pipes which can be seen on the outside of these larger than usual earphones, giving them some distinction over more run of the mill cans. Comfortwise they are much like the competition apart from size so if this type of phone is usually comfortable for you then the *HP-V99s* will be much the same. They have optional foam rings which make them larger but softer in order to suit the size of your ears.

Sonically they can't be compared realistically with huge domestic electrostatics so we brought in the impressive Sony *A21Ls* to use as a yardstick. Despite the 'bass resonator ducts' the *V99s* still lack bass quite significantly and have an upper mid forward balance that makes the *A21s* sound warm by comparison. They do have good drive and punch however, and create a good sense of space for a earphone of this type.

The *99s* are even quite revealing and show up differences in disc quality quite effectively, Stax's dummy head recordings creating good stereo imaging and depth. Admittedly changing over to the Sennheiser *HD530s* was a relief—but the same, I suspect, is true of all true miniatures.

All in all the Aiwa *HP-V99s* are pretty good considering their size, and undoubtedly improve upon the majority of direct competition. You can do better for less, but not if you can't live with a headband.

GENERAL DATA

Type	strapless intra-aural, closed-back, dynamic
Mass	9g
Size rating	very small
Length of cord	1.2m, dual jack
Comfort rating	good—
Sound quality rating	average+
Price	£50

AKG K340

AKG ACOUSTICS LTD., VIENNA COURT, LAMMAS RD., GODALMING, SURREY, GU7 1JG. TEL: (04868) 25702.



AKG's *K340* is built along the classic lines of its *240* and *280* models which went down so smoothly in our last headphone test. Thus, we were looking forward to trying the *K340* which is the most expensive headphone in the range. You can imagine our disappointment when the first sample to arrive had a dodgy channel, (this really has been the worst headphone test so far for faulty samples) but thankfully the second model to turn up proved a winner.

The *K340* is another of AKG's electrostatic/dynamic models, combining a conventional dynamic driver that provides bass and midrange with an electrostatic tweeter. This latter device apparently draws the voltage necessary to create a charged field from the incoming signal.

On a more down to earth front the *K340* has a support band connected to the earphones by elastic cords, the idea being that no manual adjustment is required for a comfortable fit. However, in my case the weight of the phones and lead is a little high, so they tend to sit a little lower than is preferred. No doubt if your head is a bit wider than mine, this won't be the case.

But such criticism is negligible when sound quality enters the equation—this is one of the best affordable pairs of headphones

I've come across. They really gave the *Lambda/SRM-1* combo a run for its money, picking up information that the reference missed and definitely improving the bass which sounded remarkably detailed and dynamic. In fact so close was the difference between these two headphones that the Stax *SRM-T1* vacuum tube driver had to be employed in order to see what the *K340* was leaving out. It still wasn't much. Essentially the advantage that the entirely electrostatic phone had was a sense of ease, which translates as lower distortion, but then again they had valve amplification whereas the AKGs had to make do with mere transistors.

These headphones are revealing, which has its pros and cons as it always does, but if you've got a good headphone drive and really want to hear more of your music then give the AKG *K340s* a try. At the price you'll be hard pushed to find better. Recommended.

GENERAL DATA

Type	circumaural, closed-back, electrostatic/dynamic
Mass	385g
Size rating	large
Length of cord	3m
Comfort rating	good
Sound quality rating	excellent
Price	£136.50

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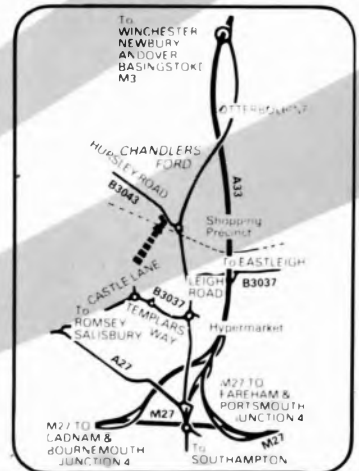
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AKG K145/S

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In our last round-up of headphones we had a look at the AKG *K280*, which was an unusual design because each earphone contained two drivers arranged in a parabolic configuration. Not a company to stick by conventional wisdom AKG's line up also includes some models which it calls electrostatic/dynamic. According to the brochure, these use a dynamic driver for the bass and an electrostatic one for high frequencies. This is a turn up for the books as all the other electrostatic drivers we've encountered require charging with an external transformer. This one (as it's only for high frequencies) gets its charge from the voltage in the incoming signal.

Being AKGs, construction isn't straightforward either. The *K145/Ss* are built around the classic twin wire system common to AKG phones, the sprung steel cables terminating in plastic blocks which house the adjustment system and the plastic headband. The supra-aural pads are quite flat and covered in a thin matt plastic, and in comfort terms they're not bad. Ear pressure is a mite higher than I prefer but it's a lot better than many. In all other respects fit is snug and secure.

On the sound quality front the unusual design of this model wasn't immediately obvious,

sounding much like a good standard dynamic. Tonal balance appeared to be on the bright side, but only subtly so. They proved to be quite revealing, showing up an odd echo effect on an Abdullah Ibrahim record which the reference ignored. The bottom end of the *145/Ss*'s bandwidth is a little dry, and this combined with the slight treble emphasis can make some material sound a little hard and lean. But that said they do a pretty good job, basically conceding only a sense of space to the electrostatics. Obviously the use of an electrostatic tweeter is quite effective – the balance could be sweeter but it's a remarkably informative headphone and one which sounds in control with all but the brashest of material.

Musically and comfortwise the AKG *K145/S* is a competent and usable headphone. Sonically it has an appealing confidence that suits the digital medium well and it would be overly critical not to recommend it.

GENERAL DATA

Type	supra-aural, semi-open, dynamic
Mass	170g
Size rating	medium
Length of cord	3m
Comfort rating	good+
Sound quality rating	good+
Price	£58.65

BEYER DYNAMIC IRS690

BEYER DYNAMIC, UNIT 14, CLIFFE IND. EST., LEWES,

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The infra-red *IRS690* is a £200 headphone superficially resembling the *DT 990*, Beyer's top of the line model, but only superficially. The little blue dome which receives the signal and various controls on the phones themselves set this model apart.

The *IRS690* system consists of a 24volt mains adaptor with a split lead, and the *IRS690* transmitter (which is a pretty slim 2.3 x 20 x 8cm) with a jack plugged lead coming out of it. The transmitter is constantly connected to the mains but the headphones need to be charged.

The system works best when you can see the shiny front panel of the transmitter. If used at an extreme angle there's a limit to how far away you can get from it, but straight on it's possible to get good reception as far as 25 feet away and probably further. When signal strength deteriorates hissing can be heard, and between pieces of music (such as when you change a record) a rather uncomfortable white noise comes through and won't go away until the output level of the source is increased. Quite a fine balance between output volume and the level of amplification in the phones themselves has to be achieved so that sound comes through directly as stylus hits vinyl. Between discs it's best to turn the phones down.

But back to basics – are they comfortable? Yes, despite their relatively high weight these soft, cushioned circumaurals are remarkably pleasant to wear. No doubt the lack of trailing wires is an advantage.

Sonically, this is an impressive headphone and virtually justifies its price on this basis alone. They sound natural and tonally are on very similar ground to the Stax *Lambdas*. Inevitably they lose out on absolute poise and clarity but they do make a very listenable sound out of the material they're presented with. They have strong, confident bass and are capable of describing a lot more of the notes given them than most, guitar strings having both zing and shape and really sounding plucked for a change. So there's no shortage of information presented in a mellow kicked back kind of way.

The *IRS690s* offer comfort, flexibility and good sound – the ingredients required for a Recommended headphone.

GENERAL DATA

Type	infrared, circum-aural, open backed, dynamic
Mass	350g
Size rating	large
Length of cord	n/c
Comfort rating	good+
Sound quality rating	very good
Price	£199



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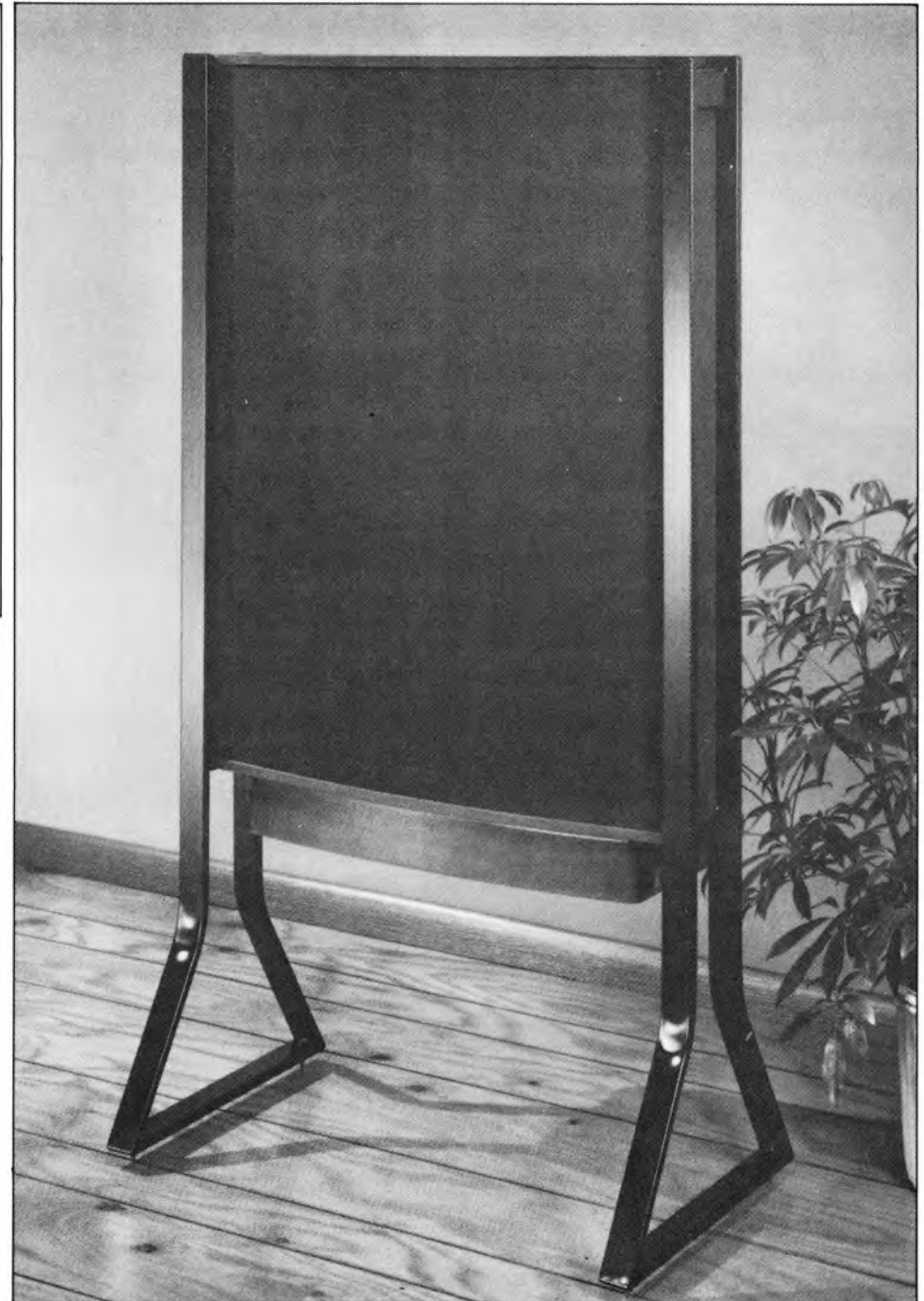
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JVC HA-D990

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



The HA-D990 is the first JVC headphone that *Choice* has reviewed in a long while and the first ever that this reviewer has come across. It's their flagship model but retails for a modest £65 and looks pretty swish for it, easily outclassing the European competition in quality of construction and finish. In fact it's so good that the shells give a very convincing impression of being aluminium, but a look inside reveals that they are plastic mouldings.

The earpads are large supra-aural types covered in a thin matt synthetic material guaranteed to keep your ears warm even in the harshest of climates. The pressure exerted on the ears is adequate for purposes of security but not so high as to cause discomfort in the long term. However, one wouldn't go so far as to suggest that it isn't a relief to take them off, although the same can be said of all but the lightest supra-aural cans.

With the more informative medium - vinyl - the D990s turned in a good performance. Balance seemed fairly accurate with, if anything, an emphasis on the lower frequencies, although this may highlight a weakness in this area on the part of the *Lambdas*. The first Sonny Rollins track sounded natural and was presented in a clear and coherent

fashion. Inevitably they were less relaxed than the reference and lost a degree of low level information but had a similar musical feel to the *Lambda* electrostatics.

With CD the story was, if anything better. At the time the Stax *Sigma* was being used as a reference and the JVCs compared more favourably, sounding remarkably laid back and unflustered. One of their main strengths appeared to be an ability to reproduce notes in their own space and time, creating a very easy going feel that encouraged listening at higher levels. With this source the slight bass emphasis noted earlier didn't make its presence felt and the 990s sounded positively flat, though 'sounded' is the operative word of course.

For the price the JVC HA-D990 is a nicely made and comfortable headphone, that it makes quite acceptable sounds is a bonus and one which deserves Recommendation.

GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	240g
Size rating	large
Length of cord	3m (OFC)
Comfort rating	good+
Sound quality rating	good+
Price	£65

KOSS TD/60

HW INTERNATIONAL LTD., 3-5 EDEN GROVE,
LONDON N7 8EQ. TEL: (01) 607 2717.



The first pair of these American headphones to turn up for this review was something of a disappointment, and obviously hadn't been that thoroughly checked. Channel balance was way out and fit was disastrous, something was obviously awry. A second pair displayed neither fault - so let's hope they are more representative of what finds its way to the shops.

Koss headphones do seem to take a different approach to European and Japanese designs, and the TD/60 takes this to new lengths by omitting any means of channel identification. Perhaps such details aren't considered to be of great consequence State-side, and frankly any nation that takes CD and Ronny Reagan so eagerly to heart is obviously not that concerned with basics.

But let's get back to the cans in hand. The TD/60 is a fairly lightweight closed back design with narrow stainless strap and basic adjustable padded headband which seems to work okay. The earpads are made of a soft, rubbery plastic and feel a little like a lightly inflated inner tube. Remarkably this is a reasonably comfortable system that proved durable over the span of an LP side. However, being plastic they do tend to make your ears sweat and it's a relief to take them off.

On the sound quality front

these phones once again veer from the norm and have a totally different character to virtually all the other models in the test. With some material this just gives a different perspective, but with others it sounds distinctly coloured. Vocals, for instance, can suffer quite dramatically.

On the positive side the TD60s don't distort too obviously and have reasonable bandwidth. Inevitably, as with all inexpensive cans, there is considerable veiling of information but this doesn't severely hamper musical enjoyment, so if the material is good the TD/60 will tell you as much - for instance Lou Reed's *New York* is proving highly listenable as I write this review.

The rather dramatic sample difference encountered and the lack of channel ID (which could be remedied with some red tape) don't inspire great confidence, but the essentially enjoyable sound quality and reasonable comfort would suggest it's worth its salt.

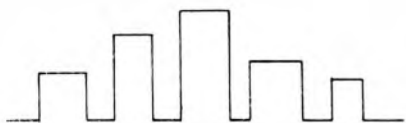
GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	204g
Size rating	medium
Length of cord	1.75m, dual jack
Comfort rating	good
Sound quality rating	fair+
Price	£20

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PIONEER SE-72

PIONEER HIGH FIDELITY (GB) LTD., FIELD WAY, GREENFORD,

MIDDLESEX UB6 8UZ. TEL: (01) 575 5757.



It's quite some time since *Choice* looked at a pair of Pioneer headphones so it's interesting to see how this line filler turns out. When we contacted Pioneer's PR man he wasn't that enthusiastic about our reviewing them, adding that Pioneer phones are designed for comfort as much as sound quality. But when we said that that sounded like a good idea he relented and sent us the *SE-72s*.

They are constructed in the classic flash walkphone style; a nicely padded headband houses one end of the adjustable stainless sliders which continue into plastic arms through joints of limited flexibility into the yokes.

The phones themselves are small and effectively closed backed but, presumably for purposes of efficiency, have a narrow slot in the back. The circular supra-aural earpads are covered in a soft, slightly furry synthetic material that is quite cosy compared to the usual plastic finish found on phones of this price. This, combined with adequate but not overpowering pressure makes for a reasonably comfy headphone, although in my case the pressure is a little high for absolute long term comfort, but I'm nothing if not fussy. Then again Pioneer specifically says that it builds headphones with comfort as a priority, and it's important to bear in mind that if

you want to listen to a whole album, your headphones have to start out very comfortable in order not to become a pain by the end of the session.

Sonically the *SE-72s* are a little warm and veiled, but they don't have any obvious tonal preferences and present music with a reasonably flat and neutral perspective. Presentation is essentially 'dark', which has a tendency to make music sound slightly heavy. The effect on a piece of morose classical music (one of the Stax dummy head recordings contains some pretty depressing Baroque) is to make it even more of a downer. Rock music takes on a flatter, denser perspective but is quite rich in detail and is even fairly subtle.

Overall the Pioneer *SE-72s* are about average in sound quality and comfort for a £30 headphone, which isn't quite enough to warrant enthusiasm. However, if you find the sound of your *Walkman* too aggressive they could be a good choice.

GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	135g
Size rating	small
Length of cord	3m, dual jack
Comfort rating	good+
Sound quality rating	average—
Price	£30

REALISTIC PRO-X

TANDY UK LTD., TANDY CENTRE, LEAMORE LANE, BLOXWICH,

WALSALL, W. MIDLANDS WS2 7PS. TEL: (0922) 710000.



A request filed at Tandy for a pair of Memorex headphones resulted in, surprise surprise, the arrival of something called the Realistic *Pro-X*. But what the heck — it's a pair of cans and that's what we were after.

The *Pro-X* is a fairly chunky headphone made up with a sprung stainless steel headband that supports a rather ineffective sliding padded strap and large plastic earphones. The latter are connected via universal joints and thus stand some chance of sitting comfortably on the ears. However, the lack of adequate friction in the adjustable head-strap means that it doesn't take any of the weight and you have to rely upon pressure to keep the phones in place, which is not the best recipe for comfortable cans.

In use, these single cable entry phones do press quite hard and consequently long term listening can become uncomfortable. However, in the reviewer's case the padded headstrap is right up against the steel band and thus takes some of the weight. Those with smaller heads may encounter problems keeping the phones in place.

The *Pro-X* is virtually a closed back design but has two slots in each phone which allow external high frequency sound in. Channel marking is in clear blue and red labels.

Using vinyl as a source the sonic character of the *Pro-X* is dark and veiled; music has a distant feel to it that doesn't suggest much in the way of transparency. On the plus side, vocals can sound reasonably natural and bass lines have a shape and presence that smaller phones fail to reproduce. However, the rolled off treble does tend to rob the sound of life, Michael Hedges' steel strings losing all the zing and attack, although the tune burbles across in a reasonably even, if obscure manner. From CD, the sound is much as above, with the *Pro-X's* major strength appearing to be its reproduction of bass notes which have appealing drive and shape, although the rest of the range can sound somewhat flat and unnatural.

Overall the Realistic *Pro-X* doesn't seem to be a great success and even at its fairly low price it doesn't represent particularly good value. It's a robust phone at least, but we can't recommend it on sonic grounds.

GENERAL DATA

Type	supra-aural, semi-open, dynamic
Mass	250g
Size rating	large
Length of cord	2.74m
Comfort rating	poor
Sound quality rating	fair
Price	£25

ROSS RE-2530CD

ROSS CONSUMER ELECTRONICS PLC, SILVER ROAD, WHITE

CITY IND. PARK. LONDON W12 7SG. TEL: (01) 740 5252.



Ross is one of a steadily growing breed of British manufacturers who recognise that the design and image of their products is as important as the ability of that product to do its job.

The *RE-2530CD* is an all black £20 closed back headphone with a pretty simple appearance and construction. It has a simple polypropylene band marked in brail for left and right, with notched runners for the phones that connect with little universal joints. The capsules themselves are pretty straightforward sealed affairs with removable, but tricky to put back on, foam earpads.

The consequence of this design is a rather uncomfortable headphone, with the pressure on the ears higher than any of the other cans in this test. With use one might expect some give in the band, but beyond deliberately stretching the thing I can't imagine them becoming comfortable for quite a while. If the earpads held the drivers away from the ear it wouldn't be so hard going, but as it is the *2530* just doesn't make the grade in the comfort stakes.

But that's only one half of the equation; the other important aspect is sound quality, an area where they fare somewhat better. Tonally they appear to have a slight preference for the higher frequencies and pick out percus-

sion and the zing of steel guitar strings. With vinyl the impression was of a slightly dry, 'bare bones' presentation which had a tendency to sound distant with some material and even somewhat flat. This brightish balance was appealing after many rather veiled phones, giving the impression of greater clarity. However, this is rather false and the lack of low frequency information robs music of depth.

Using what is purportedly their preferred source, CD, they had a tendency to sound a little lacking in finesse, ie thin and flat, but were at least controlled and painless at normal levels. Fundamentally the bright balance works against them with CDs which tend to sound thin and lacking in ambience.

Unfortunately the *RE-2530CD* isn't particularly strong in sound quality and is blatantly uncomfortable. If, however, you find you disagree with the comfort rating then they could be partnered with 'woolly' sounding sources.

GENERAL DATA

Type	supra-aural, closed back, dynamic
Mass	110g
Size rating	medium
Length of cord	2m, dual jack
Comfort rating	fair
Sound quality rating	fair
Price	£20

ROSS RE-2560CD

ROSS CONSUMER ELECTRONICS PLC, SILVER ROAD, WHITE

CITY IND. PARK. LONDON W12 7SG. TEL: (01) 740 5252.



Ross is now the only British headphone manufacturer, and in its attempts to compete with the might of Japan and Germany it is designing its products with considerable aesthetic flair. The *RE-2560* is, I believe, one of the more unusual models in the range and takes the designer approach a step further. However, due to the cost constraints on a British made product of this price the quality of materials isn't really good enough to support the design.

So what's the *2560* really like? Well, the outer band is constructed from a flat sprung metal band covered in a rubbery black tubing, terminating in notched plastic arms which support a rubber headband and the earphones. The phones are basically semi-open with a triangular vent at the front and a semi circle of small holes at the back – very pretty. The black foam earpads are removable and channel identification is aided by coloured cable entries and brail markings.

In use the supra-aural pads are snug but not too tight, proving a nice comfortable fit in my case and a significant improvement over the *2530s* which are real ear crushers. For people with small heads the adjustment system does have one possible flaw – if the adjusters are pulled down further than about halfway

they limit the phones' ability to tip outwards at the top, which makes them flare outwards at the bottom, severely compromising comfort.

On the sonic test bench they turned in better results than their cheaper brother. The main hallmark was a slight treble emphasis that could be described as brightness, but also gave the impression of good information retrieval. On the whole one isn't inclined to turn up the volume, but at normal levels they make fairly good work of the material that's supplied to them. Okay, so it's not the smoothest or most civilised of sounds but it has a spark of life. Given sympathetic material, ie rock, its shortcomings are generally overcome by a good feel and a musical consistency that encourages further listening. And after all, that's what it's all about.

If you're not too fussy about quality of finish and don't have an elfin head then Ross' *RE-2560CD* is well worth investigating

GENERAL DATA

Type	supra-aural, semi-open, dynamic
Mass	135g
Size rating	medium
Length of cord	2m, dual jack
Comfort rating	good
Sound quality rating	average+
Price	£25

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SENNHEISER HD40

HAYDEN LABS LTD., HAYDEN HOUSE, CHILTERN HILL,
CHALFONT ST. PETER, BUCKS SL9 9EW. TEL: (0753) 888447.



I had thought that Sennheiser had abandoned its classic yellow foam pads but the attractively simple (and effective) *HD40* still retains this feature. These very lightweight phones first appear to be aimed at the walkperson market, but the existence at the end of the three metre lead of a standard 6.3mm jack plug would suggest otherwise. At £18.50 the *HD40* must be one of the least expensive domestically oriented Sennheisers available and consequently doesn't go in for such luxuries as removable leads. However, they're pretty robust and for what it's worth the phones can be completely separated from the headband, itself a basic unpadded affair of near indestructible design.

Because of their low weight and elegant design the *HD40s* are an extremely comfortable pair of headphones with adequate ear pressure to inspire confidence but not discomfort. The foam pads can be removed and washed which is a plus point and channel identification is an improvement on most other Sennheisers in as much as the phones are colour coded with red and yellow markers.

In the listening tests the *40* turned out to be surprisingly good. With vinyl the balance appeared to be on the warm side but instrumental tone was re-

markably natural. Despite their lightweight build there seemed to be little loss of bass extension although they failed to pick out bass subtleties that certain other phones detected. Retrieval of low level information was a little worse than more expensive models but overall the *HD40* proved pleasantly unfatiguing and musically competent in its presentation.

Using CD the basic quality of the *40* is less obvious; one is tempted to attribute this to transparency, as certain tracks could sound flat and lacklustre. However, they still managed to reproduce music in a fundamentally acceptable fashion. Certain elements, such as strings could grate a little but overall the impression was positive, which given the price is no mean feat. The simplicity of design, coupled with a high comfort rating and competent sound quality brought together in the *HD40* make for what must be a Best Buy headphone.

GENERAL DATA

Type	supra-aural, open-back, dynamic
Mass	60g
Size rating	small
Length of cord	3m
Comfort rating	very good
Sound quality rating	good
Price	£18.50

SENNHEISER HD530

HAYDEN LABS LTD., HAYDEN HOUSE, CHILTERN HILL,
CHALFONT ST. PETER, BUCKS SL9 9EW. TEL: (0753) 888447.



By virtue of its early arrival in the *Hi-Fi Choice* offices and its apparently acceptable sound quality/comfort equation the Sennheiser *HD530* became a bit of a house headpiece and was used on and off for a couple of weeks prior to the tests. Familiarity can breed contempt or so the saying goes, but in this case the opposite occurred and it became a reasonably priced 'reference' in the listening tests.

Its similarity to the *HD520* will not, I trust, have been missed and in many ways it is identical. However, in both comfort and sound respects it is different to its red-trimmed brother. In the former case, the internal adjustable headband is made of a slightly softer plastic, the edge of which is blanket stitched to give the impression of a two-piece construction. The sonic difference is the use of an aluminium voice coil, with all the weight advantages that that entails.

The circumaural phones are like those on the *520* – large and spacious, which gives them a good start in the comfort stakes. They neither weigh a ton nor press too hard on the side of the head, so rate as one of the most comfortable dynamic headphones. In my opinion they're not quite in the Jecklin *Float* league but they are a lot more secure and suitable for many different

head sizes and shapes.

So what do they sound like? Well, with vinyl not bad at all – they are both open, tight and close to sounding natural. Compared with the reference they concede the sense of ease and ultimate clarity that no dynamic seems to match, but in a lot of respects they are competitive with the best. Specifically they retrieve a wealth of information and present it in a neutral and balanced fashion that suits all music types. If anything, they can sound a touch hard at times and do lose some nuance. They are also relatively dry at low frequencies which may not suit all tastes, but on the whole they have a level of clarity not usually found in cans of this price and deserve attention.

The Sennheiser *HD530s* are a success, combining better than average sound with excellent comfort, easily warranting Recommendation.

GENERAL DATA

Type	circumaural, open-back, dynamic
Mass	210g
Size rating	large
Length of cord	3m
Comfort rating	very good
Sound quality rating	good+
Price	£69

1 Louis Armstrong *West End Blues* 2 Johann Sebastian Bach *Brandenburg Concertos* 3 The Beatles *White Album* 4 Ludwig Van Beethoven *Symphony No 8 "Pathétique"* 5 Irving Berlin *In Patten' On The Ritz* 6 Chuck Berry *Sweet Little Sixteen* 7 Big Country *In A Big Country* 8 Georges Bizet *Carmen* 9 David Bowie *Space Oddity* 10 The Boys Of The Lough *Lochaber No More* 11 Benjamin Britten *Peter Grimes* 12 Big Bill Broonzy *Made A Date With An Angel* 13 Kate Bush *The Man With The Child In His Eyes* 14 Johnny Cash *A Boy Named Sue* 15 Tracy Chapman *Talkin' Bout A Revolution* 16 The Chieftains *Celtic Wedding* 17 Frederic Chopin *Piano Concerto No 1* 18 The Christians *Harvest For The World* 19 Nat King Cole *Monalisa* 20 Sam Cooke *Chain Gang* 21 Curiosity Killed The Cat *Ordinary Day* 22 Miles Davis *Bye Bye Blackbird* 23 Deacon Blue *Raintown* 24 Frederick Delius *A Song Of Summer* 25 Dire Straits *Brothers In Arms* 26 Bob Dylan *Highway 61 Revisited* 27 Antonin Dvorak *Symphony No 9 "From The New World"* 28 Edward Elgar *The Dream Of Gerontius*

29 Duke Ellington *Mood Indigo* 30 The Eurythmics *Who's That Girl?* 31 Everything But The Girl *Each And Every One* 32 Frankie Goes To Hollywood *Relax* 33 Ella Fitzgerald *Every Time We Say Goodbye* 34 Peter Gabriel *Sledgehammer* 35 George Gershwin *Porgy And Bess* 36 Gilbert and Sullivan *H.M.S. Pinafore* 37 Philip Glass *Satyagraha* 38 Benny Goodman *Let's Dance* 39

King Sweet Sixteen 52 The Kinks *You Really Got Me* 53 Peggy Lee *Why Don't You Do It Right?* 54 Jerry Lee Lewis *Great Balls Of Fire* 55 Gustav Mahler *Symphony No 5* 56 Felix Mendelssohn *A Midsummer Night's Dream* 57 Glenn Miller *I've Got A Girl In Kalamazoo* 58 Charlie Mingus *Wednesday Night Prayer* 59 Thelonus Monk *Monk's Mood* 60 Morrissey *Every Day Is Like*

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SENNHEISER HD520

HAYDEN LABS LTD., HAYDEN HOUSE, CHILTERN HILL,
CHALFONT ST. PETER, BUCKS SL9 9EW. TEL: (0753) 888447.



The *HD520* and *530* headphones are aesthetically similar to the *450* and *480* models we looked at a year ago – a simple stylish design with an all plastic light-weight construction. Sennheiser has always leaned towards indestructible headphones which can be dismantled to allow replacement of parts, including the supposedly unbreakable connection cord, and the *520* is no different.

Although the *HD520* looks similar to the *HD530* it is in fact a relatively basic model, employing a traditional copper voice coil and neodymium magnets. It uses a basic, hard plastic adjustable headband within a polypropylene frame which joins onto the phones with ball and socket type connections. These allow adequate movement for the phones to sit at a comfortable angle on your head. Combine this with large circumaural earpads and a reasonably light weight and you have an exceptionally comfortable set of headphones. Along with the *530s* I found these the most comfortable in the group, mainly because virtually no part of the pad or internal foam cover touched my ears, thus eliminating any sense of claustrophobia.

So full marks on the comfort front but what about the other half of the equation – sound quality? The story here is also positive, with the *520s* capable of

creating a spacious and detailed sonic picture that is tonally well balanced, even halfway accurate. Compared with the reference they lose out on the sense of ease and transparency and they can sound a little hard, but they still retain a fair sense of naturalness. Along with the *530s* they were one of the few dynamics to create an out the head sensation, and that's with Michael Hedges on vinyl, let alone the Stax dummy head recordings.

Using the digital medium results were much the same – an open, well balanced sound that's marginally less relaxed and clear than the *HD530*. In fact for CD listening one is hard pushed to justify the extra tenner, whereas with vinyl the sonic margin seemed more appropriate to the price difference.

To round up, the Sennheiser *HD520* is a very comfortable and musically capable headphone. If you've got this sort of bread to spend on cans – give 'em a blast! Recommended.

GENERAL DATA

Type	circumaural, open-back, dynamic
Mass	210g
Size rating	large
Length of cord	3m
Comfort rating	good+
Sound quality rating	good+
Price	£59

SONY MDR-CD999

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



Bar the *MDR-R10* which weighs in at a respectable £2.5K the £120 *MDR-CD999* is Sony's most expensive headphone. And so, in real terms, this is a top of the range product of which we can have reasonably high expectations. It's certainly unusual in its design, with the phones offset from the headband, so that when the latter is at the top of the head the phones are angled backwards.

The luxuriously padded one-piece band connects via a calibrated adjustment system and a swivel joint to the yoke that holds the 'phone, the whole system allowing adequate flexibility to suit the average head. The earpads are almost big enough to be called circumaural but not quite, and they are covered in a thin synthetic material that seems to be quite comfortable if a little warm in hot weather.

Being an early sample the *CD999* didn't have an English manual, but given trends with the other Sony cans its fair to assume that the single entry lead uses oxygen free copper.

Hooked up to the turntable via a preamp and a headphone amp the *999* sounded natural and relaxed, the latter being something of an achievement in this test group, where very few dynamics sounded anywhere near as at ease as the electrostatics.

Whilst the Sonys relinquished absolute detail and clarity to the Stax *Lambdas* they made a very good job of all the material played through them. And at low frequencies they had more power and drive than the reference, which helped rock tracks truck along in a very appealing fashion.

This was one of the few models which would obviously have benefited from better amplification. Perhaps Sony could come up with a valve driver for the *R10* so that beleaguered reviewers could get to grips with the soul of dynamic headphones.

Not surprisingly given its prefix this headphone is also well suited to the digital medium and reproduces compact discs in an accurate, quick and solid fashion. In fact in terms of fidelity it sounded like the closest dynamic in the group. Not to mince words Sony has come up with a highly competent headphone in the *CD999* and for both comfort and sound quality it can be heartily Recommended.

GENERAL DATA

Type	supra-aural, closed-back, dynamic
Mass	280g
Size rating	large
Length of cord	3m, dual jack
Comfort rating	good+
Sound quality rating	very good
Price	£120

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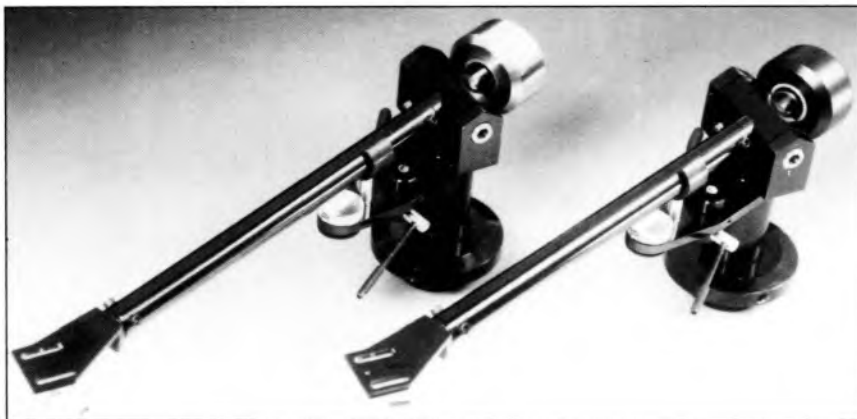
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SONY MDR-V5

SONY UK LTD., SONY HOUSE, SOUTH STREET,

STAINES, MIDDLESEX. TEL: (0784) 467000.



If you own a high quality *Walkman* or personal CD player, it's usually worth upgrading the unit's earphones to something more capable of revealing the quality of sound being produced. The Sony *MDR-V5* has been created to fulfil this function. As the picture suggests they are fairly small but at the price they should be of pretty good sonic quality. The two don't always equate, of course, but that remains to be seen.

The *V5* has a quite luxurious feel, the padded headband covering a sprung steel spine and covered in an imitation leather. Stainless steel calibrated adjusters slide into the band and have swivelling connections with the phone yokes, which in turn have a swivelling connection with the phones. So with luck the pads should rest at the same angle as your ears, thereby minimising discomfort. In practice the *V5s* do seem to be quite comfortable – they don't weigh that much and the pressure exerted on the ears is nicely balanced so that they are secure but not earbending. As the earpads are fairly small your ears don't get too hot either which is a plus point in the long term.

On the listening front, using the black plastic medium they didn't get off to a particularly impressive start, sounding a mite

veiled, coloured and tonally uneven. Further listening revealed some more subtle qualities, such as a good sense of timing, but the overall effect is of a lack of finesse and low level information leading to the inevitable conclusion that the *V5* is a sonically rather crude headphone for its price.

With CD the story is more positive. Here the *V5s* sounded lively which, although probably a distortion artefact, gives the impression of some dynamics and detail in the sound. They still sounded a little close and up front but succeeded in giving a reasonable impression of naturalness and proved capable of revealing the improvements wrought by the *500rpm* disc stabilisers that we were *A/B*'ing at the time.

At the end of the day, what is a nicely made, comfortable headphone is let down somewhat by its limited ability to reproduce music. At this price one expects a little more panache in this area.

GENERAL DATA

Type	supra-aural, semi-open, dynamic
Mass	165g
Size rating	medium
Length of cord	3m (OFC), dual jack
Comfort rating	very good
Sound quality rating	average+
Price	£50

SONY MDR-A21/L

SONY UK LTD., SONY HOUSE, SOUTH STREET,

STAINES, MIDDLESEX. TEL: (0784) 467000.



There have been few really rebellious new ideas in contemporary headphone thinking, but Sony's forward facing driver design must rank amongst them. It's a radical departure, and what's more it seems to work remarkably well, or it does now. The first example of this system that I came across didn't impress as it was uncomfortable and sonically rather ordinary, but at the time Paul Messenger was raving about a pair he had picked up in Japan so I knew there had to be something in it somewhere.

The Sony *MDR-A21* looks to all intents like a pair of in-ear walkphones with a folding frame rather than a headband, but the driver design, although superficially the same, must be different. The frame itself is very thin and light plastic and wouldn't take kindly to being sat upon.

As the earpieces sit at a right angle in the ear the amount of pressure exerted at that point is quite critical – too much would result in considerable discomfort and too little in an insecure headphone, which with the *Walkmans* for which it's designed wouldn't be any good. In my case the balance seems to be pretty good; the intrusion is far from unnoticeable but they are remarkably durable – comfortable would be too generous a word, especially if you have petite ears.

So much for comfort, what about sound? Here it has some significant strengths, most notably a remarkably open and clear sound that makes all other budget cans sound dull and veiled. This remarkable resolution of mid and high frequencies can make them sound rather bright, especially if the amplifier driving them isn't too hot as is often the case with personal stereos, but at least they have an appropriately low output.

In terms of naturalness the inevitable low frequency limitation of the design can make instruments such as brass sound overly metallic. But they are remarkably revealing and subtle, picking up low level detail that other phones completely ignore.

Overall the *A21L* is a remarkable headphone, capable of producing an open and detailed sound that most sub-£50 cans only dream about. Offsetting this is a lack of bass and a personal stereo phone that lets in a lot of external noise. Best Buy.

GENERAL DATA

Type	intra-aural, semi-open, dynamic
Mass	20g
Size rating	very small
Length of cord	3.5m
Comfort rating	good—
Sound quality rating	good—
Price	£20

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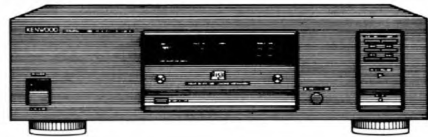
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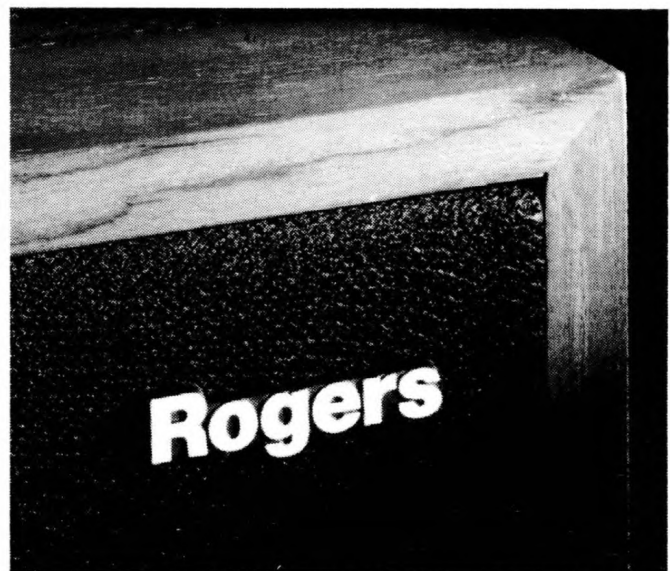


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STAX SR LAMBDA PRO/SRM-1

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We listened to the *Lambda Pro* in combination with the *SRD-7* energiser way back in February last year, and it made a very good impression. This time around we've teamed up the *SR Lambda Pro* with the Stax *SRM-1* headphone energiser. The *SRM-1/MK-2 Professional* is Stax's most expensive transistor drive unit, incorporating a direct drive circuit without using a step-up transformer and coupling capacitors, which is said to be beneficial to sound quality.

In use the *SRM-1* can be hooked up to any source capable of creating a line level signal, ie a CD player, cassette deck or amplifier making it particularly suitable for digital purists. The controls are very basic; an on/off switch and a twin ganged volume pot.

The *Lambdas* themselves are very slick 'earspeakers'. Despite their bulk they are remarkably comfortable, the truly ear sized circumaural pads pressing just the right amount and the large soft headband spreading the weight so that it's considerably less of a burden than it could be.

The *Lambda Pro/SRM-1* combo has remarkable clarity, combined with a luxurious sense of ease; instruments sit in their own space and notes have time to attack and decay in a natural fashion. It's an immediate but not

aggressive sound that, whilst nothing like the sensation created by loudspeakers, is so lush with detail that it makes most loudspeakers seem veiled.

It isn't, however, perfect. Areas where the better dynamics gave this set-up a run for its money included occasional high frequency detail and, more commonly, bass power. If anything the lower end on the *Lambdas* could be described as dry and lacking extension and drive, a criticism often aimed at electrostatic loudspeakers. Comparing the energiser with its peer, the *SRM-T1*, a certain subtle hardness is apparent along with more pronounced HF leading edges, which although a product of distortion gives the impression of greater definition.

There is no doubting the pedigree of this combination - it extracts layers of information that most headphones only suggest and it's very well made and comfortable to boot. One cannot help recommending it.

GENERAL DATA

Type	circumaural, open-back, electrostatic
Mass	460g
Size rating	large
Length of cord	2.5m
Comfort rating	very good
Sound quality rating	excellent
Price	Lambda/SRM-1 £360/£635

YAMAHA YHL-006

YAMAHA ELECTRONICS UK LTD., YAMAHA HOUSE, 200

RICKMANSWORTH RD., WATFORD WD1 7JS. TEL: (0923) 33166.



Yamaha's *YHL-006s'* outdoor oriented phones have golf ball-esque ear phones and spine like sprung bands making the phones curl up when they're not held apart by your ears. This is convenient from the point of view of stuffing them into your pocket, but putting them on your head requires some practise.

Despite the unusual construction the *YHL-006s* allow an adequate range of adjustment, achieved by pulling out sliders from within the top part of the band. There are no universal joints in this design, but because of the earpads' hemispherical shape this sort of flexibility is largely unnecessary. In the author's case a reasonable fit could be achieved by tilting the band back to the crown of the head. Because of the phones' springy nature and the shape of the earpieces they exert a fair amount of pressure on your ears and are frankly uncomfortable. One can assume that there would be some give in the band with use, but it's a poor starting point.

Listening to vinyl records, a most unlikely but telling application, they displayed a warm and veiled character that's not dramatically coloured on first impression, but with some acoustic material can sound that way. Tonally there appears to be an upper mid emphasis and a rolled

off top end, and at the other extreme there's moderate but not unusual bass extension.

The degree of veiling can be quite severe with music containing a lot of high frequency information such as steel stringed guitar where some notes are apt to disappear, but in isolation these phones are remarkably listenable. Although they display very few hi-fi virtues they still bring across the basis of the material and due to their lack of obvious distortion long term listening is a distinct possibility.

With CD much the same effects were noted, a thick warm balance conveying the essential musical gist of the piece in a pleasant if somewhat vague and flat manner. The qualitative difference between recordings can just about be detected so there's at least some transparency.

The Yamaha *YHL-006s* are stylish and reasonably practical phones that are highly suited to neutral or bright sounding portable sources.

GENERAL DATA

Type	supra-aural, open back, dynamic
Mass	79g
Size rating	small
Length of cord	2.4m, dual jack
Comfort rating	average
Sound quality rating	average
Price	£30



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GLOSSARY

The Hi-Fi Choice dictionary of audio terminology, explaining all the weird and wonderful adjectives used by our reviewers, as well as technical abbreviations.

AM: Amplitude modulated; see 'Medium Wave'.

ACOUSTIC BREAKTHROUGH: Sound that gets into the turntable and hence the cartridge from the air and thereby creates a risk of acoustic feedback.

ACOUSTIC FEEDBACK: If any sound in the room can find its way through the body of the record deck to the cartridge stylus, then that sound will be reproduced from the loudspeakers, along with the wanted programme material. If too much of this sound from the loudspeakers is picked up by the cartridge in this way then a vicious circle of acoustic feedback will be created.

ACTIVE: Speaker systems which contain electronic crossovers and where the drive units are connected directly to power amplifiers.

ALIGNMENT PROTRACTOR: A device used to minimise the lateral tracking error of a cartridge/arm combination.

AMPLITUDE: Size or magnitude; hence the amplitude/frequency response, known normally simply as the frequency response, which describes the relative loudness of the system at different frequencies with a constant input voltage.

ANECHOIC: Without echo; a special room or 'chamber' with thick sound absorbing materials on all surfaces to prevent reflections.

ARM MASS: More accurately called *effective* arm mass, because it is *not* the weight of the arm on a pair of scales. It is the mass of the arm and cartridge combination that appears to be concentrated at, and thus felt by, the stylus tip which is tracking a record groove. There is nothing inherently good or bad about arms with light or heavy effective mass; what matters is the manner and choice of their combination with cartridges of different compliance and the low frequency resonance produced by such combination.

AZIMUTH: With reference to tape and cassette recorders, the alignment of head gap to tape path.

BALANCE: 1) The overall relative loudness perceived at different frequencies (eg bass, treble); 2) the accuracy of the match between the two channels of a stereo transducer (eg cartridge or pair of loudspeakers).

BANDWIDTH: A range of frequencies with presumed defined upper and lower limits.

BASS: Lower part of the frequency spectrum.

BELT DRIVE: The motor has its rotational speed geared down to the required platter speed (33 $\frac{1}{3}$ rpm for LP discs) by a rubber or similar resilient belt which runs round a small pulley on the motor shaft and a large pulley attached to or part of the platter.

BEXTRENE: A plastics material frequently used for bass and mid-range cones.

BIAS: (*turntable/arms*) Because the cartridge on a pivotal arm is being drawn across the record surface by the stylus tracking at an angle offset from the pivots, groove friction produces an imbalance of lateral force. Bias is the application of a compensatory lateral force acting in the opposite direction.

BIAS: (*tape*) This refers to a high frequency current passing through the record head which allows the audio current also passing through the head to produce reasonably linear magnetisation of the tape at all levels permitted by the combina-

tion of each machine with the tape. The lowest level of bias is required for ferric cassettes, a slightly higher one for ferrichrome, an even higher one for chrome or pseudochrome, and the highest for metal.

BOTTOMING: The stylus scraping on the distorted rounded bottom of the groove due to incorrect stylus geometry.

CANTILEVER: The thin rod or tube that connects the stylus to the armature and hence the cartridge body.

CAPACITANCE: An element of electrical impedance that is particularly important when matching pickup cartridge, arm leads and amplifier input characteristics to achieve a flat frequency response from discs.

CLIPPING: This is reached when a circuit is overloaded and overdriven, resulting in bad waveform distortion and audibly unpleasant effects.

COLORATION: A general term used to describe the audible effects of distortions, particularly in loudspeakers and record players. These are usually caused by frequency response irregularities and/or resonances.

COMPATIBILITY: The selection of interdependent components to achieve optimum system performance; notably arm/cartridge mass/compliance matching, cartridge electrical loading, or loudspeaker compatibility with amplifiers.

COMPLIANCE: A measure of the springiness of the cantilever/armature seen from the stylus, expressed in compliance units (Cu), where 1 cu = 10⁻⁶ cm/dyne.

CROSSOVER: An electrical circuit which uses combinations of inductors, capacitors and resistors to divide the signal from the power amp into the required frequency bands and with any necessary equalisation for feeding to the individual drive-units of the speaker system.

CROSSTALK: The leakage from one channel to the other in a two channel stereo system.

CUTTER: Mechanism used to cut recorded signal onto lacquer master; consists of turntable, lathe, cutting head, cutting and servo amps.

DIN: German standards body, responsible amongst other things for a popular range of standard plugs and socket specifications.

DAMPING: A means of controlling resonances by means of a resistive medium (electrical, mechanical, or acoustic depending on situation).

DECIBEL (dB): A logarithmic unit that is convenient for expressing ratios that span a wide range on a linear scale. For simplicity it can be regarded as a measure of relative loudness.

DISTORTION: Literally this can mean any deviation from the original, but usually refers to harmonic rather than intermodulation distortions when not specified.

DOLBY: Covers various signal processing/deprocessing systems, but normally refers to the B & C noise reduction systems used in cassette record/replay, and the B system used for music-cassette replay.

DOPING: A technique involving the application of damping to a loudspeaker driver cone in order to assist in controlling resonances.

DOWNFORCE: The weight, measured at the stylus, which holds it down in the groove.

DRIVE UNIT (DRIVER): The term used to distinguish the loudspeaker unit itself, be it bass, midrange, treble or fullrange in application, from the complete loudspeaker system which combines drive units, cabinet and crossover into a total design.

DROPOUTS: Momentary reductions of programme level due to inadequate head/tape contact caused by oxide particles shedding off the tape onto the head gap, or inadequacies in tape transport or tape.

DYNAMIC RANGE: The ratio in dBs between the quietest sound that can be successfully recorded and the loudest which can be accepted without serious distortion on an average programme.

EFFECTIVE MASS: The inertia, or mass-controlled resistance to movement, of a device, particularly important with regard to tonearms.

EFFICIENCY: The amount of acoustic power delivered for a given electrical input power.

ELECTROSTATIC: A principle employed in some loudspeaker transducers using static electricity effects to set up a polarising field within which the modulated transducer medium moves.

ELLIPTICAL STYLUS: A specially shaped stylus profile that makes the 'plan view' radius along the length of the groove smaller than the 'elevation view' contact radius viewed from the front.

EQUALISATION: (*general*) The deliberate modification of frequency response, usually in response to some engineering limitation or deficiency.

EQUALISATION: (*tape*) This refers to the necessary change in frequency response required of an amplifier so that overall flat frequency response is obtained from a tape medium. Equalisation is required both on record and replay. Any tape recorded on a good cassette recorder should have the same inherent response when played back on another correctly set up machine, since all playback equalisations should have been standardised. These standards are normally specified by the time constants of the circuits involved, eg 79 μ s or 120 μ s (see 'Microseconds').

FARAD: Measure of capacitance.

FM: Frequency modulated; often used to describe radio transmissions of high fidelity potential on the VHF band.

FARAD: Measure of capacitance.

FERRITE ROD: A short rod type aerial used for AM reception; may be fitted internally or externally to a tuner or receiver.

FERRO-FLUID: A magnetic fluid which is introduced into the voice-coil gap to provide damping and/or improved cooling.

FILTER: A circuit (normally) used to restrict the bandwidth of a system; may be fixed or switchable.

FREQUENCY RANGE OF SPECTRUM: Can refer to any particular group of frequencies, but commonly applied to the audible band from 20 to 20,000 cycles per second (Hz), extending from the deepest bass to the highest audible harmonics.

FREQUENCY RESPONSE: The variation in output over a frequency range, particularly of a transducer; can be expressed as a range with decibel limits, or depicted graphically.

Hz (HERTZ): 1 Hz = 1 cycle per second and is a measure of frequency which corresponds to musi-

cal pitch (the higher the frequency the higher the pitch).

HF: High frequency.

HARMONIC: Harmonics are the whole number multiples of a base frequency called the *fundamental*.

HARMONIC DISTORTION: The addition of unwanted harmonics to a signal.

HUM: A low frequency interfering sound produced by break-through or interference from mains wiring or circuitry.

IHF: American Institute of High Fidelity, an important standards body.

IEC: An international standards body.

IMPEDANCE: Measure of resistance (and reactance) in alternating (ie audio) signals; this is of some importance in the compatibility of both cartridges and headphones with amplifiers. For convenience sake is measured in ohms.

INTEGRATION: Used to describe the success with which the output from two drive units combine to give smooth output through the crossover region.

INTERMODULATION (IM): A form of distortion arising from two or more signals producing non-harmonic signals that correspond to the sum or difference of the two frequencies.

KILO (k): prefix meaning one thousand.

LED: Light Emitting Diode; an indicator light.

LF: Low frequency.

LATERAL FRICTION: The resistance to movement of an arm and cartridge combination in the horizontal plane (ie across a record), caused by friction in its bearings.

LINEAR: A transducer that produces an output that exactly portrays its input over the required operating range is described as linear, and is hence distortion free. Hence also nonlinearities (distortions).

LINE-CONTACT: A special stylus profile that extends the ellipse, increasing contact length up and down the sides of the groove.

LOAD OR LOADING: The impedance (including resistive and reactive components, ie ohms, mH, pF) seen by one component looking back to its inter-connected component; of importance in compatibility of cartridge/amp, and amp/headphone.

'LOUDNESS': An equalisation circuit frequency switchable on amplifiers which is designed to compensate for presumed hearing characteristics at low listening levels by boosting bass and treble.

MOL: Maximum operating level of tape normally referring to 5% distortion of 315Hz or 3.15kHz.

MEDIUM WAVE: An AM transmission band incapable of high fidelity signals.

MICRO-(μ): Prefix for units meaning one millionth of.

MICROSECONDS (μ s): The time constant of a resistor capacitor combination involving a frequency response change (equalisation).

MIDRANGE, MIDBAND: The central part of the audible frequency range where the ear is most sensitive.

MILLI-(m): Prefix for units meaning one thousandth of.

MODULATION: The audio signal is 'stored' by means of modulations within a medium, eg the 'wiggles' in the groove of a plastic disc, or the

magnetic coding on a tape.

MODULATION NOISE: An additional noise added to tape noise, which increases with the degree of modulation of the tape, caused by the properties of the magnetic coating. This noise has most of its energy near the modulation frequency (causatory tone).

MOVING COIL: A transducer (eg cartridge or headphone) where the signal is generated by the movement of a coil within a magnetic field.

MOVING MAGNET: The most common form of cartridge transduction, where the magnet moves while the coils are held relatively stationary.

MULTIPLEX FILTER (MPX): A circuit which introduces severe attenuation at supersonic frequencies to decrease interference encountered with the output from some stereo FM tuners.

NANO (n): Prefix meaning a thousandth of a millionth of.

NOISE: Random unwanted low level signals.

NOISE MODULATION: An unwelcome breathing effect that can be heard on some programme material, produced by poor noise reduction systems, or circuits.

OCTAVE: Two-to-one ratio of pitch or frequency.

OFFSET ANGLE: The angle measured between the centre line of the pickup cartridge and the line which joins stylus and arm pivot point.

OHM: Unit of electrical impedance (including reactance) or resistance; also kohm, where 1 kohm = 1,000 ohms.

OVERHANG: The extent to which the cartridge stylus extends beyond the centre of the platter is critical, and controlled by fore and aft adjustment of the cartridge on the arm.

PASSIVE: The most common type of system, where drivers and crossover are driven from a single power amplifier.

PEAK RECORDING LEVEL: A level above which distortion becomes apparent. This distortion is introduced when the oxide particles almost reach magnetic saturation, and thus will accept no more level.

PHONO: The most commonly used plug/socket combination in audio components.

PICO (p): Prefix meaning one millionth of a millionth of.

PORT: An opening in a cabinet which is tuned to characteristics of the bass driver and the enclosure volume to provide reflex type bass-loading.

POWER AMPLIFIER: The part of an amplifier that provides power to drive the loudspeakers: usually integrated, it is sometimes a separate component.

PREAMPLIFIER: The part of an amplifier that accepts the input signals, sorts them, applies any necessary equalisation, and then passes the signal to the (normally integral) power amplifiers.

PRESENCE: A quality of forwardness or immediacy in a sound balance, generally related to an upper-middle frequency response boost.

PRINT-THROUGH: A pre- or post-echo of a loud signal created by magnetisation occurring from one layer to an adjacent layer after the tape has spooled or been recorded.

Q: A measure of the magnitude and shape of a resonance; the higher the Q, the sharper and more severe in amplitude the resonance.

REFLEX: a system of bass loading (using port or ABR) which offers improved efficiency and bass power handling at the expense of subsonic control compared to a sealed box.

RUMBLE: The low or medium frequency sound produced mechanically by any moving parts in a turntable, mainly the motor and platter bearings.

SENSITIVITY: The volume of sound output for a specific electrical voltage input.

SEPARATION: As between the two channels of a stereo pickup; see *crosstalk*.

SHIBATA: A special stylus extending the elliptical to a 'line contact' type of profile.

SIDE-THRUST: A force acting on cartridges in pivoted (ie not parallel tracking) arms, due to the stylus/vinyl 'friction' acting along the line of the offset angle; hence bias or side-thrust compensation.

SIGNAL-TO-NOISE, SIGNAL/NOISE, S/N: The difference in total output when an applied signal is removed.

STYLUS: The specially shaped piece of diamond in contact with the groove and connected to the cantilever.

SUBSONIC: Below the audible range, ie below 20Hz.

SQUARE WAVE: A signal which consists of a fundamental plus a (theoretically infinite) series of odd (3rd, 5th etc) harmonics in a precise phase and amplitude relationship. It is useful for examining transient performance, symmetry, resonance control and 'ringing'.

THD: Total harmonic distortion.

TRACING: The following of the groove modulations by the stylus; hence for example tracing distortion, caused by the inability of a spherical stylus to trace the high frequency inner grooves on a disc.

TRACKABILITY: The ability of cartridge to cope with large amplitude modulations (or of the arm and cartridge to follow the groove itself properly).

TRACKING ERROR: The discrepancy between the truly tangential angle at which a record is cut and the slightly off-tangential angle at which it is tracked by a stylus on a pivoted arm during some parts of the arm's travel.

TRANSIENT: Signal of very short duration.

TREBLE: Upper part of frequency spectrum, typically above about 3kHz.

TWEETER: A small drive unit designed to operate over the high frequency range.

ULTRASONIC: Frequencies above audibility, ie greater than 20kHz; also *supersonic*.

VERTICAL TRACKING ANGLE (VTA): The angle at which the plane of motivation of the stylus is set with respect to the vertical when viewed from a side elevation of the cartridge. Should match the 20° cutter standard.

WEIGHTING: A factor or function that is applied to a measurement to increase its relevance and usefulness.


WOOFER: A drive unit that operates over the bass portion of the audio range.


WOW AND FLUTTER: Low and high frequency pitch variations (from poor tape transport of turntable platters with speed drift).


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
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
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
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
THOMSONS, 2 High Street, Great Baddow, Chelmsford, Essex. Tel (0245) 71465 JVC, Kenwood, Mitsubishi, Toshiba, Tannoy, Mordaunt-Short, Acoustic Research, Wharfedale, Philips, Audio-Visual dealer. Home trial Free installation Service dept Access, Visa, HP Open 9-1, 2-5.30 Mon-Sat. Open 9-1 Wed

GLoucestershire


ABSOLUTE SOUND AND VIDEO, 40/42 Albion St, Cheltenham (0242) 583960. A.R., Denon, Dual, Linn, Meridian, Mission, NAD, Rotel, Technics, Yamaha, etc (Closed Wed) BADA MEMBER 

AUDIO EXCELLENCE, 58 Bristol Road, Gloucester (0452) 30046 Audio Research, Dual, Krell, Linn, Magneplanar, Naim, NAD, Yamaha and lots more. Closed Mon BADA MEMBER 

HAMPSHIRE

ABSOLUTE SOUND AND VIDEO, 4 Feathers Lane, Basingstoke, Hants RG21 1AS (0256) 24311 A&R, Audiolab, Denon, Dual, Linn, Mission, NAD, Rotel, Technics, Yamaha Dem and home trial facilities Mon, Tues, Thurs, Fri 9.30-6, Sat 9.30-5.30 Closed Wed. Free installation Credit facilities Access, Visa, Connect, Amex, Diners Service dept. BADA MEMBER 


HAMPSHIRE AUDIO Ltd, 2-12 Hursley Rd, Chandlers


Ford (0703) 252827/265232. Quality CD and analogue agencies 5 dem studios Large free car park. BADA MEMBER 

HOPKINS HI FI, 38/40 Fratton Rd, Portsmouth PO1 5BX (822155) 830753 Technics, Quad, Monitor Audio, Tannoy, Denon, Nad, Heybrook, Aristo, Onkyo, plus others Dem facilities, appointments necessary Access, Visa 9-5.30 Open to 6 Thurs Closed Wed Service dept.

HERTFORDSHIRE

AUDIO IMAGE, 15 Middle Row, Stevenage, Herts SG1 3AW. Tel: 0438 360606 Aiwa, Goodmans, Harman Kardon, JBL, JVC, Kenwood, Panasonic, Pioneer, Sony, Technics Dem room & lounge Home trial. Free installation. Service dept. Access, Visa Instant credit £1500 Closed Weds. Open 9-6

ACOUSTIC ARTS Ltd, 101 St Albans Rd, Watford, Herts (0923) 45250 A&R, Audiolab, Denon, Magneplanar, Quad, Rogers, Meridian, TDL, Jadis, Krell Mon-Sat 9.30-5.30 BADA MEMBER 

THE AUDIO FILE, 27 Hockerill St, Bishops Stortford, Herts CM23 2DH (0279) 506576 9.30-5.30 6 days Dealer Of The Year 1988/89 Linn, Naim, Rega, Quad, Cyrus, Arcam, Musical Fidelity 0% credit BADA MEMBER 

ISLE OF MAN

ISLAND COMPACT DISC CENTRE, Parliament Square, Ramsey (0624) 815521 Arcam, Aristo, 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, ChargeCard. Service dept.

VJ HI FI, 29 Guildhall St, Folkestone. (0303) 56860 Mon-Sat 9-6 NAD, Yamaha, Marantz, Cambridge Audio, Denon, Kenwood, Rogers, Dual, NVA, 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, Spendor, 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, Aristo, 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, Naka-

michi, 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 9.5-3.0 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 **3A**

AUDIO T, 190 West End Lane, London NW6 (01) 794 7548 Mon-Sat, 10-6 Two single speaker dem rooms Access, Amex, Visa BADA MEMBER **3A**

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 **3A**

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 **3A**

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 **3A**

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 9.5-3.0, 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, Incatech, 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 **3A**

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 **3A**

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 **3A**

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, Alphason Single speaker dem room Home trial + free installation 10-6 - closed Mon Open till 8pm Thurs and Fri

WA 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 **3A**

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

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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

CHANNY 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

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GRIFFIN AUDIO Ltd, 94 Bristol St, Birmingham (021) 692 1359 Linn, Naim Audio, Rega, Creek, Denon, Nakamichi, Quad, Mission, Monitor Audio, Rotel BADA MEMBER **3A**

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 **3A**

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 9.5-3.0 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 Alphason, 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 (0865) 65961 A&R, Denon, Linn, Mission, NAD, Rotel, Yamaha Also 256, Banbury Rd, Summertown BADA MEMBER **3A**

ASTLEY AUDIO LTD, 3 Marketplace, Wallingford (0491) 39305/34349 AR, Dual, Kenwood, Mordaunt Short, Mission, Monitor Audio, Philips, Technics, Tannoy, Yamaha Tues-Fri 9.5-3.0, 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 **3A**

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 9.5-3.0 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, Magneplanar, 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 Alphason, Ariston, B&W, Celestion, Marantz, Nakamichi, Pink Triangle, Quad, Sony, Technics Free installation Service dept Access, Visa 9.5-3.0 Closed Thurs BADA MEMBER **3A**

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MID SHROPSHIRE AUDIO, 24 Peverill Bank, Dawley, Telford (0952) 502828 Agencies include Alphason, Apollo, Ariston, Audio Innovations, Goldring, Ion Systems (full range), Marantz, Michell, Ortofon, QED, Royd, Ruark, Sansui, Sennheisser, SD Acoustics, SME, Target Guaranteed used equipment also available Free delivery

SELECTED DEALER DIRECTORY

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
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.

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 

SUFFOLK

EASTERN AUDIO 41 Bramford Rd Ipswich. (0473) 21217. 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, Oracie, 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) 672796. 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)


BOWERS AND WILKINS Ltd, 1 Becket Buildings, Littlehampton Rd, Worthing (0903) 64141. B&W, Cambridge,

Dual, JVC, Mordaunt-Short, Nakamichi, Philips, Shure, Quad, Sony. 2 dem rooms. Mon-Sat 9-5.30, Weds 9-1. Home trial facilities, free installation, credit to £1,000. Access, Visa. Service dept.


CHICHESTER HI-FI, 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

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LINTONE AUDIO LTD, 7-11 Park Lane, Gateshead. (091) 477 4167. Dem + home trial. Free installation. Access, Visa, Amex, Diners. Credit to £1000. 9-6 Mon-Sat. Service dept. BADA MEMBER 

WILTSHIRE

ABSOLUTE SOUND AND VIDEO, 60 Fleet Street, Swindon. (0793) 38222. A&R, Denon, Dual, Linn, Meridian, NAD, Rotel, Technics, Yamaha. (Closed Wed). BADA MEMBER 

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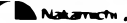
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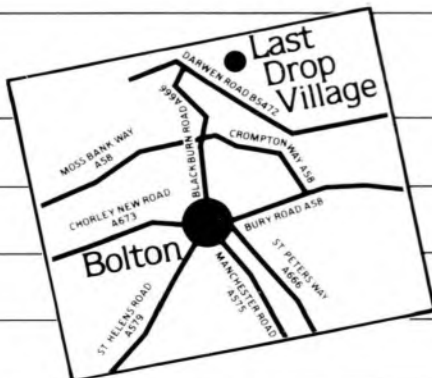
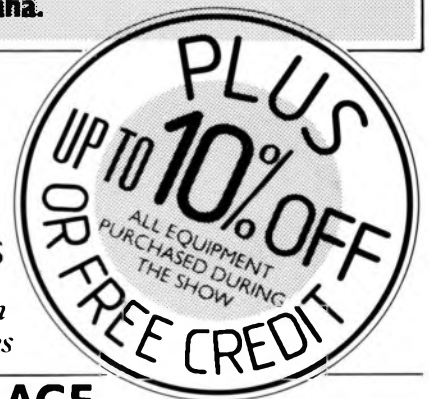
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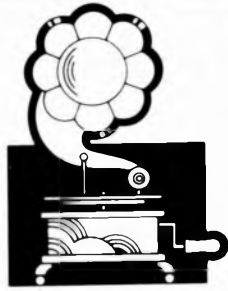
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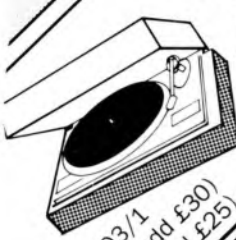
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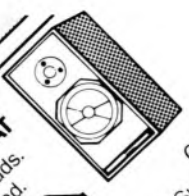


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THE DIRECTORY

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 – ie a cassette deck rated 'excellent' in sound quality will not usually offer the same standard of fidelity as a similarly rated

turntable or CD player (unless you can get hold of first generation copies of the master tape!)

The Comments column contains a potted summary based on the original review, emphasising the salient points of a product's character and sonic performance. The space available doesn't allow for great detail but in the 20 or so words we have attempted to put across the essence of the review, in some cases using quotes from the review itself. Obviously, important information on compatibility or auxiliary equipment used in the test cannot be included, and it is best to refer to the original review for this, of which more later.

The next column(s) varies from category to category but is usually either features or specifications, the former being facilities available on a cassette deck or amplifier or the type of drive system on a turntable.

Specifications vary with product type but usually relate to suitability or capability, for instance arm matching figures are given with the cartridges which tie in with the mass figures for the tonearms themselves, making it easier to avoid compliance/mass mismatches.

Perhaps the most influential letters in the Directory are those found in the Value column, the *Rs* and *Bbs* denoting the Recommended and Best Buy ratings that are appended to products we consider meritorious. The Best Buy tag means that a product not only offers good sound quality but is reasonably priced as well. With source components a price limit of approximately £300 is usually used as a

guide. Recommended means that either the performance of a product is particularly good irrespective of price or, alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. An ideal situation would be to choose suitably priced Best Buy or Recommended products from relevant categories and create a Best Buy system, but, due to the variety in tonal balance that exists in much audio equipment (especially the electromechanical elements – ie cartridge and speaker) system building is not quite that simple. These ratings make a useful guideline for shortlisting components, but only experiencing the actual combination will tell you whether it works for you.

The final column contains a reference to the issue of *Hi-Fi Choice* which featured the complete review. If you wish to get a better idea of a product by reading the complete review it is possible to order a copy (if still in print) through our back issues department. Every *Choice* issue contains a Back Issues page for this purpose.

The Directory is constantly updated with the latest reviews and price changes as well as having discontinued products removed. If a listed product is updated to a 'mark two' form and the alterations are purely cosmetic or not too extensive we sometimes leave the product in with its current model number and an asterisk to denote that it has changed since our original review was published.

SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems as strong as ever, and certainly represents the route taken by those who place sound quality ahead of other criteria.

Yet those who choose the separates route still have lingering doubts – usually completely unjustified – over the compatibility of components from different manufacturers. Gross incompatibilities are very rare nowadays, only likely to rear their heads amongst the most exotic components. Here the delicate art of 'supercompatibility' really takes over the major role and might be regarded as the key to 'real' hi-fi.

There are now three different pre-recorded music media competing for the attention of the hi-fi user, and to go for all three will either cost a lot of money or involve substantial compromises in the sound quality of each. For this reason many separates purchasers may start with just one source, adding others or a tuner when funds permit.

There will always be controversy over the relative qualities of LP, CD and cassette. LP is still the choice for ultimate sound quality – particularly for those prepared to spend a substantial sum on a good quality turntable system. Furthermore the vinyl repertoire is still the cheapest, largest and most varied.

Cassette has never really challenged vinyl's superior quality, but it is a multiple role format, offering 'go anywhere' flexibility, a uniquely useful recording capability, plus a broad catalogue of pre-recorded music cassette material. As a hi-fi medium cassette suffers from pre-recorded material which has been improving but is still patchy in quality, and can usually be bettered by a home recording. There is also the worry that a tape made on a specific machine usually replays best on that machine, which may cause aggravation when upgrading a few years hence. It is worth remembering that though such opportunities are rarely possible or practical, a live recording onto cassette using good quality microphones can be the hi-fi equal of any other source.

CD is the latest challenger to these two established media, using a digital instead of analogue storage format. The sound quality remains controversial, hailed as near perfect by its fans but derided by vinyl freaks, so it is probably fairest to say that CD is fine for most listeners, but may not suit everyone; certainly the lack of background noise, defects and deterioration over time are major strengths.

While there will always be arguments about the different music storage and transmission formats available to the hi-fi listener, there is also controversy over the relative importance of the different components which make up the system chain – by which is meant the source, the amplification, and the loudspeakers (and for the pedantic the room itself, though there's often little that can be done here).

For many years the 'weakest link' theory proposed that the loudspeakers needed the most attention, that amplifiers merely had to have sufficient power, and that turntables were pretty well perfect. However, this perspective has become steadily discredited by an alternative 'theory of precedence', which stresses that no subsequent component can make up for the inadequacies of its predecessors – all it can do is supply its own additional degradations. In such a context it is not uncommon to find more than half the system budget allocated to the record player, with scrimping and saving made on amplifiers and loudspeakers, even though these are used all the time whatever the source.

Choosing the components of a system is only part of the task of getting the system as a whole working as well as possible. Good turntables and loudspeakers both benefit to a surprising degree from proper support – from stands that enable them to give their best performance, whether floor-standing or wall mounted.

Siting of components within a room can play a significant role, as can the room itself. Some people may prefer an acoustically more 'live' room than others, but most will agree that the larger it is the better, because this tends to provide smoother and better extended bass reproduction. All rooms create reflections and standing waves, and the effects of these are more severe if all opposing walls are parallel, similar distances apart, and with hard reflective surfaces. Provided that the loudspeakers can be placed fairly symmetrically, slight asymmetry elsewhere in the room is usually helpful.

The loudspeakers are most critical of placement, because it is their job to create the stereo image, and it will be impossible to do this if the sound from each is not roughly similar at the listening position. Each loudspeaker should operate in a similar immediate acoustic environment, unencumbered by other furnishings and structure, and a similar distance from listener, nearby walls, and corners. Some loudspeakers are designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers benefit from being closely mechanically coupled via proper stands to the floor.

There is some debate about the best form of fixing, however, adjustable spikes through to the

floor proper or seated into the tops of cross-head screws are generally regarded as the best solution in most circumstances. There is no need for paranoia about using spikes through normal pile carpets because the holes will be almost impossible to find when the stands are removed.

Most decent quality turntables are fairly immune to feedback from loudspeakers, so it should not matter too much if these items are sited fairly close to each other. Indeed it is debatable whether any advantages gained from keeping the turntable well away are not lost through the need to use longer connecting cables.

Mixing and matching the components of a record player to get optimum results can be something of a black art, over and beyond the fairly simple business of choosing a cartridge of roughly the right compliance to suit the arm effective mass. Certainly the combining of turntables and tonearms is not a simple matter, and this is where a good specialist dealer will come into his own, both in terms of recommending good combinations from the models he holds in stock, and then in correctly carrying out the sometimes tricky set up procedures which are often required to get the best results.

The key to getting the best results from a separates system lies in finding an experienced and skilled dealer in the first place, one who takes the trouble to find out what you really want and then demonstrate some likely alternatives, without trying to cram his own particular prejudices down your throat. To some extent the customer's task must be to discover for himself whether the dealer in question is competent or not. Membership of trade organisations like BADA can be a worthwhile pointer to a degree of professionalism, but the bottom line is whether the dealer in question can create a good sound in his own shop. If he can't, there is precious little chance of him doing so in your home. The best dealers should lay on demonstrations so you can hear the differences between components for yourself, and hear the sort of improvements which can be had at different price strata. You can then establish the sort of performance you are prepared to accept within whatever budgetary constraints you have set.

The Directory has been compiled so that it can be used by *Choice* readers as a buying guide. A guide in the sense that you should use the information in it to make a shortlist of equipment suited to your needs and budget, and then audition it at a dealers before taking the plunge. Because tastes inevitably differ it would be unwise to buy purely on the basis of our recommendation and dealers are the most experienced people around when it comes to making systems work as a whole.

THE DIRECTORY

TURNTABLES & TONEARMS

The schizophrenic split between consumer electronics and 'real hi-fi' is most obvious amongst turntables. The former are supplied simply as a means of playing vinyl in a system context. Cheaply manufactured in the Far East, these are complete players with a variety of automatic facilities, sometimes tied into system remote control. But engineering compromises severely limit sound quality, cartridge choice may be P-mount restricted, and such machines are rarely stocked by specialist hi-fi dealers these days.

Specialist turntables offer big sound quality

improvements, but lack so-called convenience features (that practised users often find irksome). Such turntables at the cheaper end of the market (sub-£350) tend to be supplied with matching tonearm, and often include a 'starter' cartridge. Still better quality is found at higher prices amongst the separate motor units and tonearms. Careful partnering and set-up is essential for these individual components, but 'naturally sympathetic' combinations do exist, and the good dealer can help.

Listed separately as integrated players and as turntable motor units and tonearms, our **sound**

quality rating is based on results achieved using a high quality system – but in point of fact the turntable is usually the limiting factor soundwise in any system. **Lab performance** summarises the speed stability, vibration generation and environmental isolation of turntables, along with the friction, alignment and adjustment of tonearms. The tonearm's physical characteristics also define a range of mechanically compatible cartridges (see cartridge listings).

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research EB101 £230	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Alphason Solo/Xenon MCS £365/£262	Average+ Good	The deck is warm and euphorious 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-FQ555 £170	Below Average Poor	Clear midband sound but woolly bass and crude treble. Ease of use however ranks highly, and there's little to go out of adjustment	Auto, direct drive, 5.5g		67
Kenwood DP-990 £300	Average Average	Smart, slick and massive player suitable for low compliance cartridges only. A good but not inspired performer.	Semi-auto 2 speed direct drive, 16g		67
Kuzma Stabi/Stogi £575/£349	Average+ Stabi: Good; Stogi: Excellent	Stabi is powerful, spacious but 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
MAD5120 £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	Below Average Below Average	Fat, assured and forward presentation, but ragged and subjective speed stability problems. With a little further development, it will be a winner	Manual, 2-speed belt drive inc cartridge, 13g		67
Revox B291 £660	Average— Average—	Sound quality ranks as below average. Subjective bandwidth is narrow and the music lacks grace and energy. Ease of use however is unrivalled	Automatic, remote controllable, direct drive parallel arm, prefitted cartridge		55
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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THE DIRECTORY

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Technics SL-Q033 £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 limp 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 Synco £265	Good Good	A particularly happy blend of qualities endows the Synco with a blend of subtlety and force – the mailed fist in the velvet glove. Easy on the ear in the best sense	Manual, belt drive, suspended motor unit	R	67
Michell Gyrodec £595	Good Good	Sweet and natural sounding player, well exploited by the Rega RB300 arm. Aesthetics, and the acres of acrylic, are unique	Manual, belt drive, suspended motor unit		55
NVA Turntable £499	Average Good	A surprisingly fast and assured performer, but with lightweight bass and a little aggressive. Easy to set up, the price (necessarily includes stand	Manual, belt drive subchassis, stand, 33 1/3rpm		60
Oracle Alexandria Mk III £825 – £995	Very Good Very Good	One of the most beautifully presented players made, and fully supported by superb separation, dynamics and a euphonious style of delivery	Manual 2-speed belt drive	R	67
Oracle Delphi III £1450	Very Good Very Good	Stable imaging, good bass and refined detail, it's well made and consistent in service – but very expensive	Manual, belt drive, subchassis	R	60
Oxford Acoustics Crystal Reference £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 TOD £650	Good Excellent	A state of the art player, easy to set up but extremely fussy about partnering equipment and state of tune. The test sample suffered flutter derived roughness (presumed not typical)	Manual 2-speed, outboard PSU	R	67
Rega Split Slab Modification Kit £74	Good Good	Clever and cheap upgrade kit that protects the initial investment and which adds clarity and environmental isolation to a fine but microphonic original	Conversion suspended chassis kit for Rega 2/3		67
Roksan Xerxes £655	Excellent Excellent	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Setting up is best left to an authorised 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 Good	Fine, honestly specified and well built player which easily better its closest stablemate, the IIX	Manual 2-speed, external PSU	R	67
Systemdek IV £495	Good Very Good	The level of wow is a theoretical concern at least, but elsewhere this player shines, combining euphony, information and imaging in a polished, untemperamental package	Two-speed manual belt drive	R	67
Thorens TD521 £629	Average Average +	Nice product. Unexciting, rather undynamic and insubstantial sound quality, but facilities such as ability to accommodate 12 inch arm compensate	Manual, belt, suspended motor unit, 78rpm, pitch control,		55
Townshend Avalon £299	Good Good	Some smear and coloration, probably due to structural shortcomings of the plinth, take the edge off this otherwise well turned out and well priced machine. Worth trying if you can't afford the full-blown Rock	Manual 2-speed belt drive	R	67
Townshend Rock £450	Good Good + +	Tight, tidy sounding player which works with a wide variety of (non-tangential) arms, giving almost CD like precision and clarity. Good bass depth, dry balance – our Editor's favourite deck, in fact	Manual, belt drive, solid, arm damping, various optional extras	R	55

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
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 Lim cutout	12.75g	R	55
Alphason HR100S £395	Good + + Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	48/Coll
Ariston Enigma £99	Average Average +	Good but not the best in its class: mid-band sounds a little uneven; treble a trifle "brash"	11.5g		48
Audio Technica AT1130 £186	Good Good	Well suited to most cartridges including high compliance ones, the AT is smooth and tonally neutral, if slightly lacking in 'balls'	8.5g	R	67
Decca International £49	Average + Average +	This uni-pivot design gives a rather rich tonal balance and some bass mudding. 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 13F 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

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NAME PRICE		LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
B&O MMC5 £24	Average + Average		Cheapest in the family – smooth treble and good focus, but the bass was left in the wings	5-15g Normal, MM		38 (Summary)
B&O MMC4 £43	Good Average +		Solid and well balanced in the midrange, the '4 lacks bass impact	5-15g Normal, MM		48
B&O MMC3 £57	Good Average		Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment	5-15g Normal, MM		48
B&O MMC2 £87	Good Average +		Only a modest improvement on its cheaper brothers (and sisters)	5-15g Normal, MM		48
B&O MMC1 £112	Very Good Good		Great clarity and detail at high frequencies but a slightly plodding bass. It may appeal more to the classical enthusiast	5-13g Normal, MM		48
Cello Chorale £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 +		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 nm4	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 "goods"	8-16g Normal, MM		43
Goldring G1040 £79	Average + Average –		High frequency extension was improved by the van den Hul tip, nice looking model – no great actress	8-16g Normal, MM		48
Goldring Eroica L £95	Average Average +		Open and relaxed sounding, the L version is just that bit more refined than its high output brother	7-18g Low, MC	R	54
Goldring Electro II £149 complete	Average Average +		A pretty decent allrounder that did not excel sufficiently to warrant recommendation	8-16g Normal, MC		43
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

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TO NEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Helius Orion 2 £490	Very Good Very Good	Very expensive but with a performance that merits recommendation	12g	R	48
Linn LV Plus £129	Good + Good	The fixed headshell provides an improvement over the LVX resulting in better clarity, detail and punch	13g	BB	48
Linn Ittok LVII £429	Very Good Very Good	Suitable for many turntables this top-quality arm performs best with the LP12, the combination exceeding the sum of both parts	13.5g	R	48/Coll
Linn Ekos £895	Very Good Very Good	Superb, state of the art design which builds significantly on Ittok's strengths	9g	R	67
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		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 +	Technically and subjectively this cartridge represents a new dawn for AT, in the twilight of analogue audio	6-13g Low, MC	R	54
Audio Technica ATOC9 £400	Average + Very Good	Tonal colours were reproduced faithfully while stereo images were clearly isolated and focused despite contributing to a thoroughly integrated whole. Slightly less transparent than more costly MCs	6-14g Low, MC	R	60
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 YM10VE £12.50	Average Average –	A good tracker. Sounds rather bunched-up but not totally incoherent – for very basic systems only	5-15g Normal, MM		54
Azden GM1E £30	Average – Average –	Of academic interest only, this high o/p MC is seriously flawed in sonic terms	8-18g Low/normal, MC		54
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

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CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
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
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 bass were energetic, bouncy and punchy	5-13g Normal, MM	R	48
Nagaoka MP11 Boron £38	Average Average+	Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations	5-13g Normal, MM	BB	48
Nagaoka MP10SB £40	Average Average+	Stilton's mods have improved the fine detail resolution of this popular budget model	5-15g Normal, MM	R	54
Nagaoka MP11 Gold £45	Average- Average+	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal, MM	R	48
Nagaoka MP11 Gold SB £70	Average- Average	Excessive price loading for a blob of aluminium	2-6g Normal, MM		54
Ortofon OM5E £15	Average- Average-	The OM10 is a hi-fi cartridge - the OM5E is not	5-16g Normal, MM		43
Ortofon VMS5E II £14	Average Average	Sound quality was thought fair for the price, though a little 'untidy'	8-18g Normal, MM		38 (Summary)
Ortofon OM10 £20	Average Average	One of the leading "cheapies", this gives a fine level of sound quality for the price, with good matching compatibility	5-15g Normal, MM	BB	48
Ortofon VMS 10E II £21	Average- Average-	Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot	Normal, MM		38
Ortofon VMS20E II £35	Average Average	One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better	3-10g Normal, MM		48
Ortofon OM20 "0	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 uninvolved	5-15g Normal, MC		48
Ortofon OM40 £80	Average Average+	Highly competent engineering, secure tracking and decent sound quality are major strengths. But it's a little cold, a little polite	3-8g Normal, MM		48
Ortofon 540 £100	Average- Average	Graced with an advanced FGII stylus our sample possessed too high a compliance for broad arm matching. It could also sound a little unforgiving	3-8g Normal, MM		67
Ortofon MC20 Super £170	Average+ Good+	An "inviting" sound quality, polite rather than exciting it approaches much more expensive models, but does not better them	6-15g Low, MC	R	48/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

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CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
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 vdf-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 gentile, 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
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/Coil
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 SOX2000 £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

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

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
Albarray 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
Albarray 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
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
Aria Acoustics Aria 12 £299	Poor Very Good	A plain looking valve power amp that's something of a wolf in sheep's clothing giving many dearer amps a run for their money	12W	BB	63
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 Very Good	A dynamic powerhouse, load tolerant and sonically reliable	100W	R	62
Beard Audio CA35/P35mkII £595/£795	Fair + Very Good	Good build quality and a very smart finish combine with a characteristic valve sound to make a first class amplifier capable of giving hours of musical enjoyment	35W, MM/MC, 4 inputs	R	63
Beard 506 £1195	Good + Good +	A versatile valve preamp — the bass sounded lively if a touch softened while the treble was detailed but lacked a little sparkle and air	4 inputs MM/MC		50
Beard M70 £1995 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
Counterpoint SA12 £1250	Good + Good +	A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes	100W		Collection
Creek CAS 4040 II £179	Good Good	The Mk II has no problems and is a fine all rounder	30W, MM, 4 inputs, tone controls	BB	62
Creek CAS 4140 S2 £219	Good + Good	Redesigned for '88, this is a fine allrounder with good moving coil input, plain presentation	40W MM/MC 3 line inputs	BB	62
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 Excellent	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

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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, monoblocks Opt/Coax dig + 2 tape, 4 line and MM/MC inputs		68
Denon PDA-6600 £1,000/pair	Excellent Excellent	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles	250W monoblok, remote power	R	60
DNM 3A From £1000	Good + Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R*	44
E.A.R. 802/509mkII £920/£1550	Average Very Good	Extremely well made and combining the sonic strengths of both transistors and valves this £AR combo warrants attention	100W, MM, 6 inputs, monoblocks	R	63
E.A.R. 549 £3,000/pair	Very Good Very Good	A valve monoblok that measures like a solid state amp is itself an achievement, but exceptional power delivery and bass 'slam' is not fully matched by delicacy and transparency elsewhere	200W monoblok, bias setting		60
Exposure VII/VIII £360/£340	Very Good Good	Supplied as a combination without the separate preamp power supply, this pre power combination performed satisfactorily especially on the moving coil input	50W, MM/MC, 3 inputs, straight line		62
Exposure VI/VII Dual/VIIIS 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 monoblocks 41 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
Haffer DH120 kit form £325	Fair	We didn't build one, see below	60W		44
Haffer DH-110/XL-600 £360/£995	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, R 2mm, tone + processor loop	R	74
Haffer 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 v/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-5010 £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-7010 £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
Magnum A100 £1995 pair	Good + + Good +	Given their massive power rating a pair of A100's make a fine stereo power amp; ideal for high levels and with a wide dynamic range for digital programme	320W		50
Marantz PM25 £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

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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	R	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
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 Excellent	If the hot-box aspect is not a deterrent, this is something of a bargain. A big amplifier scale of sound which is just a little rough-edged	135W	R	50
Musical Fidelity MVX & 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
Quicksilver Mono £1495	Good Good +	Moderately improved for '88 the Quicksilver still rates well despite up and coming competition	60W monoblok 4/8ohms		57
Radford SC25 £862 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

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
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 converter. 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

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THE DIRECTORY

LOUDSPEAKERS

Last item in the hi-fi chain, to some extent the loudspeaker is merely the slave of what has gone before, capable only of reproducing a signal as good as it is fed. Nevertheless the distortions (colorations and stereo effects) introduced by loudspeakers (and rooms) tend to be more immediately obvious than those anywhere else in the chain, so careful choosing according to taste is very important.

The average loudspeaker consists of a smallish enclosure, much of which may have begun life as

part of a tree, plus a couple of drive units hidden behind a removable grille. Inside the box lurks a simple electrical circuit known as a crossover, which divides the incoming (full range) signal into the right bits for the drivers to handle. Variations on the above formula are specifically identified in the entries. The designer's primary task is to balance the **sensitivity** of the loudspeaker (how loud it goes for a given electrical input) against the **bass** extension (how low does it go) for the given box **size**. After that such subtleties as coloration and

dispersion come into the equation.

Careful **placement** of the loudspeakers within the room is as important as the initial choice of model. For good stereo they need to be more or less the same distance from nearby walls, and preferably on 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)	Uneven Uneven	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
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 CD6 £290	Average Good—	An unusual cube-shaped model designed for wall mounting gives exceptional bass extension from a small box, though it's also a bit heavy, coloured and slow	28.5 x 28.5 x 28.5cm stands against rear 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/Coll
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 "ballys" 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	86dB/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 LM1 Mk II £249	Average+ Average	Probably one of the best "micros" ever made, worth considering for special applications (boats or vehicles). Upgraded since our review	24 x 15.5 x 20cm shelf or flush mount	86.5dB/W 80Hz		31
B&W 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

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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
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
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 underwhelmed	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 muddle	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 Average +	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvils	46 x 26 x 25cm 40cm from wall on 45cm stands	89dB/W 65Hz	R	53
JPW AP3 £210	Good Average +	Pretty good stereo and well balanced overall it had its own character which is well suited to vinyl replay	52 x 25 x 29.5cm near wall on stands	90dB/W 57Hz	R	46
KEF 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

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THE DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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
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 45cm 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 MG11la £2650	Good Very Good	Another excellent true-audiophile loudspeaker this American panel speaker helps to convey much of the original character of the music	180 x 62 x 38cm well clear of walls	84-86dB/W 35Hz	R	46
Marantz LD20 DMS £150	Average Average	Recommended more for CD users than vinyl keepers, soundly engineered and built but should be heard before bought	36 x 23 x 24cm free space on 45cm stands	86.5dB/W 55Hz		53
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 R100 £159	Average+ Average—	Tonally quite neutral, but with small box character, negligible low bass and a rather 'hard' midrange	40.5 x 25 x 21cm free space on stands	87.5dB/W 70Hz		46
Monitor Audio 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 MS10 II £90	Average Average—	One of the best miniatures around. A borderline Best Buy because of the bass limitations, which may depend on your taste	29 x 20 x 17cm wall bracket	86dB/W 75Hz	R	53
Mordaunt Short MS100 £189	Average+ Average+	A 'mid forward' tonal balance is its main drawback but other aspects such as ambience, transparency and stereo depth compensate	32.5 x 22.5 x 21.5cm stands near wall	85dB/W 80Hz	R	46
Mordaunt Short 45Ti £230	Good Average	A sensitive tandem-bass number that can be driven loud but loses its balance a bit and can be subtle	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 Very Good	This exceptionally clean and clear design offers real subtlety and finesse. Bass quality is light but exceptionally clear; the treble is smooth if slightly shallow	48.5 x 25.5 x 16.5cm open space and stands	87.5dB/W 65Hz	BB	66
Musical Fidelity MC-4 £499	Very Good+ Very Good	Achieving a very high standard, the MC-4 sounds detailed and coherent like the MC-2, but with more bass depth and solidity, and large image scale	56.5 x 26.9 x 29cm open space on stands	87.5dB/W 60Hz	R	59
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 silicate-based cabinet confers good box and bass performance, but the sound could be more neutral for the price	32 x 28 x 32cm stands in free space	88dB/W 65Hz		74

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THE DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Opus 3 Capella £495	Good Good	The sound of this Scandinavian curiosity certainly benefits from the crushed marble enclosure, though presentation is strictly DIY	32 x 40.5 x 26(ave)cm amongst books in bookcase	86.5dB/W 45Hz		66
Quad ESL-63 £1538	Good+ Good+ +	With its unusual but subtle characteristics this classic electrostatic may not be punchy in the bass, but has strengths that some cannot live without	92 x 66 x 27cm open stand well clear of wall	84dB/W 34Hz	R	60
Richard Allan CDS £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 OBS £695	Average Good+	Large but unusually pretty, needs a big(fish) 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
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 23.5 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 tony, 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
Tannoy Westminster £3400	n/a Good+	These awesome horn loaded speakers are remarkably controlled and impressive, if only suited to a few pickets 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
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 end 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

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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 60Hz	R	68
Wharfedale 505/2 £169	Average Good	This lively Wharfedale provides plenty of speaker with unusual refinement for the money, and should be fairly tolerant of room siting	44 x 25.5 x 24cm stands 1ft from wall	86dB/W 55Hz	BB	66
Wharfedale 510/2 £299	Average Average—	Even in it's latest guise, this loudspeaker still sounds hard, cluttered and lacking innate clarity. The bass is uneven and midband coloured	61.5 x 28 x 29.6cm near wall, high stands	89dB/W 50Hz		59
Yamaha NS 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	This
Aiwa AD-F370 £130	Average Average	Adequate but uninspiring recorder with detail shortcomings but good control layout and successful sounding with recorded musicassettes	Dolby B, C, HX Pro, bias adjust		63
Aiwa AD-R470 £150	Average Good	For once, an auto-reverse deck with the performance of a decent unidirectional one at a similar price. The Aiwa is modern in concept and execution, and has good, transparent electronics	Dolby B/C/HX Pro, auto reverse, cue & review, bias adjust	BB	69
Aiwa AD-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	This
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		This
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	This
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	This
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 yunks	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment, CD direct	R	63
Akai GX-32 £200	Average Poor	Constrained and smeared sum this deck well. It has poor bass and treble definition alike, though it proved well aligned for prerecorded cassettes	Dolby B/C, variable bias, headphone out, track search		69
Akai GX-52 £249	Very Good Very Good	Well finished and a pleasure to use this well specified deck sounds clean and defined with all tape groups, with or without Dolby	Dolby B, C, HX Pro, track locate features	BB	57
Akai GX-6 £350	Good Good	There is a strong sense that someone has really thought this one through; it has an indefinable 'specialness'	Real-time counter, track search, Dolby B, C, bias adjust	R	52
Akai GX-95 £400	Good Very Good	Well designed and finished cassette deck with features well judged to please the audiophile – especially switchable Dolby HX Pro and switchable panel display. The calibration system is simple and effective, and the deck sounds great	Dolby B/C/HX Pro, 3 head, manual tape set-up	R	69
Denon DR-M07 £125	Poor+ Average	There were several problems with the test player that render it an unsafe purchase. This is a pity since despite the antiquated control system, the deck is capable of refined sound quality	Dolby B/C, fine bias adjust		69

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CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Denon DRM-500 £170	Good Very Good	Powerful, refined and detailed sound, and an excellent transport are keys to the success of this clearly styled addition to the range – but why no timer standby?	Dolby B/C/HX Pro, variable bias	BB	This
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	This
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	R	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		This
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		This
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-4511 £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	This
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		This
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	This
Proton AD-200 £140	Poor Poor	Sound quality is essentially on a par with many portables, and has nothing to do with high fidelity. The main problems are an unrelenting hardness and an almost total lack of detail	Dolby B & C		57
Proton AD-300 £200	Average— Poor	High levels of flutter give sound a roughness and coarseness that rules it out for high quality work. The record and replay electronics certainly deserve better	Auto reverse, Dolby B & C		57
Revox B215-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	This

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THE DIRECTORY

CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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	This
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		This
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	This
Sony (WMD6C) ProWalkman	Good+ Excellent	"One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket"	Dolby B, & C	BB	60
Sony TC-RX60ES £250	Average Average	For once a stable sounding auto-reverse deck but sound quality is rather 'dirty' and compressed, especially with Dolby C	Auto-reverse, Dolby B/C/HX Pro, auto tape recognition		63
Sony TC-RX80ES £350	Average+ Good	Clean, powerful and detailed sound, especially without Dolby C. Stable pitch - but prerecorded cassettes sounded disappointing	Auto reverse, Dolby B/C/HX Pro, bias/level adjust	R	63
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		This
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		This
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	This
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		This
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		This
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		This
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	This
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		This
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

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THE DIRECTORY

CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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	This
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

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	Mid-width, alpha-numeric display, remote, optical interfaces	R	63
Sony DTC-1000ES £1299	Very Good Very Good	Fine, consistent performer with accomplished tape handling and good build quality	Standard track ID and search, remote	R	63

CD PLAYERS

This all-digital music source is well established, despite still high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise with automatic and programmable play, plus track skip and fast music scan - frequently under full remote control. However, many vinyl enthusiasts find CDs sound less involving than

top quality vinyl replay

Introduced five years ago at around £500, CD players now average less than half that price, and for the main offer improved performance besides. Even cheaper players may have the latest decoding chips and the most useful play features; extra money can buy remote control, remote volume control, audio 'tweaks', plus improved build and component

quality control.

Compared with many hi-fi components, CD players give impressive lab performance, though there are differences between players nonetheless. Sound quality variations are even more marked, particularly in a good quality system. As it behaves very like a preamp, there are no problems connecting a player to a normal amplifier.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
ADC CD 2000E £330	Good+ Fair+	One of the slimmest players in the business but nothing special inside. Nice ergonomics but overpriced	Remote, timeshared 16 bit		64
Aiwa DX-M45 £149	Fair Fair	Cutdown Philips technology, but results are quite good for this British made machine	Manual	R	64
Aiwa CD-001 £300	Good Good	Pretty close to Recommendation, delivering a respectable sound quality and lab performance from an ergonomically attractive package, but ultimately failed to excel in any particular respect	Track entry/volume remote, direct recorder connection etc		58
Aiwa XC-007 £499	Very Good Good	Creditable sound despite inverted output, high tech engineering with very good lab performance. A worthy contender but not cheap	Remote, keypad, timer, digital output, pseudo 20 bit, dual DAC		64
Akai CD-52 £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64
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, hdp, comprehensive display etc	BB	70

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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)	R	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.	R	58
Arcam Delta Black Box £250	n/a Very Good	This rich, powerful and articulate sounding DAC transforms the majority of medium price CD players.	Needs D-out CD players	R	60
Arcam Delta 70 £500	Good Very Good	This solidly built British player has attractively understated presentation with straightforward, simple ergonomics. The very good sound quality shows a steady improvement over earlier samples.	Simple remote, headphone socket etc.	R	58
Cambridge Audio CD2 £650	Fair Very Good	The finest midrange in digital audio is sufficient grounds for Recommendation, though there remains a tinge of disappointment that the CD2 didn't get closer to big brother elsewhere, notably in the bass.	16x oversampling, remote control	R	58
dbx DX5 £640	Good Poor	Sound quality proved a single disappointment, though it's refreshingly unique in providing semi-pro post-production facilities that some users will undoubtedly relish.	Track entry/volume remote, compression, impact recovery, ambience etc.	R	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, hdp 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
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	R	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	R	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	R	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, hdp socket, calendar display etc.	R	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.	R	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/CDA94 £1600	Very Good Excellent	Taking its logical place at the top of the Marantz CD hierarchy, this two-box combination delivers reference standard lab and listening test results, albeit at a price which seems a little steep. Very refined.	Favourite track selection, remote, balanced output etc.	R	60
Marantz CD12LE £2500	Very Good Very Good	This may be very expensive but it is very well made. Technical performance is very good and the sound is the best from Marantz yet.	Two box, digital processor, FTS, optical connection, hdp 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	R	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	R	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.	R	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, hdp, remote track entry, digital output	R	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	R	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	R	51

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

THE DIRECTORY

CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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-6100 £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 Excellent	Close to state of the art in nearly all areas - soundstaging, clarity and simple lack of artificiality. A well made and sophisticated player.	Track entry remote, calendar display, index search, etc.	R	64
Revox B126 £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
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-C50M £250	Fair Fair	The Sony concept of an autochanger is interesting and executed with characteristic thoroughness. The lab and sound test results reveal it to be of only average quality.	Carousel autochanger, remote, multi disc programming, variable hdph socket		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/DAS-R1 £5000	Very Good Very Good	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 Z0880 £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
Technics SL-P1200 £800	Good + + Good	Looking more like a desk workstation than a stackable component, this will appeal to the creative recordist and semi pro user. Sounded pretty good.	Headphones, remote control, search dial cueing, etc.		51

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THE DIRECTORY

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	Below Average Poor	The system has potential in an A/V context, but is patently lacking in a purely audio one. Only the CD excels	Component system with A/V amp, no speakers		65
Marantz MX673CD System £900	Average+ Average	Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess	Various A/V inputs, remote, speakers optional		54
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 AI	Twin deck, programmable T/T, amp, CD, speakers	R	65

TUNERS

The radio medium operates at a much lower profile than TV, but in areas outside pop music the BBC service is the envy of the world. Live Prom concerts can rival all other sources from a hi-fi perspective. Only the FM (VHF) bands give stereo hi-fi sound, though AM (MW & LW) are useful for receiving certain transmissions in the UK.

Something of a hi-fi afterthought, tuners are often selected merely to match a chosen amplifier

cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is well spent.

Tuners come in two basic types. Analogue models tune gradually (and usually manually) across

the bands, and can have analogue or digital displays; they are often preferred for sound quality, and are certainly best for AM bands. Digital tuners offer convenient automatic tune facilities and hold many station positions in pre-set memories.

(The Lab and Sound results for models tested in issue No. 65 refer to FM only. For AM results see under Comments.)

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai AT-52L £150	Very Good Very Good	Holds its own on FM against many much more expensive tuners, but AM is very poor	All bands	BB	65
Akai AT-93L £250	Good+ Good+	By AM standards presentable (good) while FM delivers the goods	All bands, aerial switch	R	65
A&R Arcam Alpha £149	Good Average++	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB*	50
A&R Arcam Delta £270	Very Good Very Good	Hi-fi sound on FM, good on AM, a dependable British all-rounder	6AM, 6FM presets, FM/MW, LW display, manual tune	BB	55
Denon TU 450L £130	Average+ Average+	Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation	FM/AM Digital MW/LW	R	50
Harman Kardon TU920 £299	Good Average	Rather weak sound quality for the price despite good lab test results	16 presets, AM/FM, digital auto scan, active tracking		55
Harman Kardon Citation 23 £559	Good Very Good	Fine performance, interesting features and ease of use are this tuner's forte, and the sound quality is top notch	FM/AM seek/manual adjustment, muting, 16 presets, remote control	R	60
Hitachi FT-MD 5500 £200	Excellent Good++	A powerful, good sounding tuner with versatile facilities	16 presets, FM, AM, MW auto scan, digital, signal meter	BB	55
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-110DD £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

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TUNERS					
NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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 time 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

HEADPHONES

There are a variety of different approaches to headphone design, and examples of each turn up in this group. Amongst the more expensive esoteric models, electrostatic drivers are used in square open-backed phones such as the Jecklin and Stax models. The majority of these come with some form of transformer which takes the signal initially from the speaker terminals on the amplifier. The actual speaker cables then travel from this unit via a

bypass switch to the loudspeakers.

The more down to earth models feature dynamic drivers in circular open-backed designs. The advantage of open backs seems to be a correspondingly open sound and a less claustrophobic feel to the music. One can also of course hear external noises and irritate people on public transport.

The third category are closed-back designs,

which are useful in situations where it is necessary to block out background noise.

Another means of distinguishing different types is the way they sit on your head or ears. There are three styles: circumaural models enclose the ear and rest on the side of the head; supra-aural designs press on the outer ear (pinna); and intra-aural types rest inside the ear and are popular amongst users of personal stereos.

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Aiwa HP-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		This
Aiwa HP-V99 £50	Average + Good -	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		This
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		This
Aiwa HPEX-200 £90	Good Good	Modern looking and well finished the Excelias, as they are dubbed, had meaty bass and sounded reasonably open for the type	Circumaural, closed-back, dynamic		63
AKG K135 £35	Fair Poor	Despite a very appealing design the K135s don't live up to the usual AKG standards, though they do have the ability to reproduce rhythm well	Supra-aural, semi-open, dynamic		63
AKG 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	This
AKG K240 Monitor £60	Good Very Good	Something of a classic these AKGs are very user friendly in all respects; sonically on the warm side of neutral	Circumaural, semi-open, dynamic	R	63
AKG K280 Parabolic £110	Very Good Good	A very revealing and unusual twin driver design that uses the same principle as a satellite dish to beam sound into the ear	Circumaural, open-backed, dynamic	R	63
AKG K340 £136	Excellent Good	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	This
Audio Technica ATH 909 £55	Average Average	Quite impressive in the treble though a bit bass shy, the 909s worked well at highish levels	Circumaural, semi-open, dynamic		55
Audio Technica ATH 910 £65	Good Average	The closed-back 910s are an improvement on the 909s with a nice rhythmic quality rarely found with headphones	Circumaural, closed-back, dynamic	R	55
Audio Technica ATH-911 £75	Very Good Very Good	Nicely finished dynamic headphones with all the trimmings, plus a very clean and subtle sound	Circumaural, open-backed, dynamic	R	63
Beyer DT 325 £30	Fair Very Good	Lightweight in more ways than one, the 325s may be a little bright for some systems and tastes but will suit duller sources	Supra-aural, open-back, dynamic	R	63
Beyer DT330 Mk II £45	Poor Good	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £69	Good Good	On their own the 550s sound articulate with a slightly 'gritty' treble and 'keen' midrange; not suitable for headbangers!	Circumaural, semi-open, dynamic		55

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HEADPHONES

NAME PRICE	SOUND COMFORT	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Beyer DT880 £90	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £119	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing, neutral sound that is hard to criticise	Circumaural, open-back, dynamic	R	55
Beyer IRS690 £200	Very Good 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	This
Jecklin Float Model One £79	Very Good Good	Whilst very unusual in appearance the Floats give remarkable sound quality and openness at a reasonable price	Circumaural-ish, open-back, dynamic	BB	55
Jecklin Float Model Two £99	Very Good Good	Helmet shaped and pretty unflattering but open sounding and comfortable in the long term. Note lack of adjustment means you should try before you buy	Circumaural-ish, open-backed, dynamic	R	63
Jecklin Float Electrostatic £399	Excellent Good	One version of the state-of-the-art, these electrostatics have an openness of sound rarely found in the breed, with good dynamic range to boot	Circumaural-ish, open-back, electrostatic	R	55
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	This
Koss TD/60	Average Good	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		This
Koss K/6X Plus £30	Poor Fair	'Sixties-style' phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Pioneer SE-72 £30	Average - Good +	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		This
Quart Phone 30 £40	Fair Good	Whilst not as seductive as their PMB25 predecessor the 30s are reasonably neutral and do improve on some of the competition - though not stunning	Circumaural, semi-open, dynamic		63
Quart PMB 25II £40	Good Good	Despite a somewhat unconventional suspension system the 25s put in a convincing and enjoyable performance with warm yet lively balance	Circumaural, open-back, dynamic	BB	55
Quart Phone 70 £70	Good Good	Competent performers that were hard to criticise but lacked the life and sparkle of which some of the competition are capable	Circumaural, closed-back, dynamic		63
Quart PMB 65 £70	Good Good	Quite revealing and neutral albeit with the usual closed back sound, this competes well with more established models	Circumaural, closed-back, dynamic	R	55
Quart PMB 85 £90	Very Good Fair	These more expensive Quarts bear a striking resemblance to the Jecklin Float models and use two drivers per ear. Sound is a bit bass heavy but not bad overall	Circumaural, open-backed, dynamic		63
Realistic Pro-X £25	Average - Poor	Robust, unanimously uncomfortable and heavily veiled in sonic terms - not a great success	Supra-aural, closed-back, dynamic		This
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		This
Ross RE2560 CD £25	Average + Good	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		This
Ross RE-2760 £35	Fair Poor	Stylish white cans from the only British firm in the business. Unfortunately sound quality is not up to par in this price range	Supra-aural, closed-back, dynamic		63
Sennheiser HD30 £13.50	Poor Good	Built specifically for the personal stereo market these small and light Sennheisers have a slightly synthetic sound, but are an upgrade on the average Walkphones	Supra-aural, semi-open back, dynamic		55
Sennheiser HD40 £18	Good - Very 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	This
Sennheiser HD450 £27	Fair Good	Modern, simple and lightweight phones that are remarkably robust and which turned in a relaxed if weighty performance that was at worst pleasant	Supra-aural, semi-open, dynamic	R	63
Sennheiser HD480 £37	Fair Good	Using the same shell as the 450s, the 480s were a little softened and unrevealing by comparison with their competitors	Supra-aural, semi-open, dynamic		63
Sennheiser HD420SL £47	Good Good	The 420s gave a full and tangible quality to instruments and voices; whilst not the most revealing headphones around they would suit slightly brash sources	Supra-aural, open-back, dynamic		55
Sennheiser 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	This
Sennheiser HD530 £70	Good + Very 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	This
Sennheiser HD540 Ref Gold £160	Very Good Good	The 540 Golds prove that dynamic headphones can be subtle, informative and capable of creating a remarkable sense of space	Circumaural, open-back, dynamic	R	55
Sony 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	This
Sony MDR V3 £30	Good Fair	Portable stereo oriented phones that are very nicely made and combine clarity with a pleasant lack of distortion	Supra-aural, closed-back, dynamic	BB	63
Sony MDR-V5 £50	Average + Very Good	A nicely made comfortable headphone let down by a limited ability to reproduce music in a natural fashion	Supra-aural, semi-open, dynamic		This
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	Very Good 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	This
Sony MDR-R10 £2500	Very Good + Excellent	Costly state of the art sealed moving coil design built to the highest standards using the finest materials. Sound quality reflects this care, being big, clear, sweet and refined	Circumaural, closed-back, dynamic	R	72
Stax SR34 £140	Very Good Fair	The least expensive Stax headphones around, the SR34s are lively and rhythmic with good tight bass and a sweet midrange	Supra-aural, open-back, electret		55
Stax SR84 £210	Very Good Very Good	The stepping stone between dynamics and full electrostatics, these electret phones are revealing, open and highly enjoyable	Supra-aural, open-backed, electret	R	63
Stax Gamma pro/SRD-X pro £296/£230	Excellent Very Good	The Gamma pros are like a stethoscope for your hi-fi, revealing subtleties that many loudspeakers fail to resolve	Circumaural, open-backed, electrostatic	R	63
Stax SR Gamma £299 (inc. SRD-6 Adaptor at £100)	Very Good Very Good	The next model down the Stax range from the Lambda, the Gamma is an excellent headphone with little to criticise but the price	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £545 (inc. SRD-7SB Mk 2 Adaptor at £185)	Excellent Very Good	A bit of an industry reference the Pros are frighteningly revealing, bringing across more information than loudspeakers costing twice as much	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £360/ SRM-1 energiser £635	Excellent Very Good	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	This
Stax Lambda Signature/SRM-T1 £470/£895	Excellent Very Good	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		This

THE DIRECTORY

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 DG658 £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+ Excellent	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personals to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line BB in/out, varispeed		52/56

PERSONAL CDs

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Goodmans GCD-10 £120	Average— Poor	Cheap, flashy and not short on accessories the GCD-10 is a rather noisy player that left a lot to be desired on the sound quality front	13.5 x 3.7 x 18cm, 478g, mains adaptor		66
Kenwood 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 plain top end	13 x 4 x 17.5cm, 516g, 3" ready, twin hdph sockets		66
Sony 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	No 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 beefy 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-D73 £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 tinnny 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

THE WORLD'S NO 1 GUIDE
TO BUYING HI-FI

THE DIRECTORY

STANDS AND SUPPORTS

It's becoming more and more apparent that all the components in a hi-fi system benefit from being placed on the right kind of support. It is already acknowledged that performance of electro-mechanical transducers, such as turntables and loudspeakers, can be greatly improved by using highly rigid supports. This notion has been expanded to include electronics such as amplifiers and compact disc players, and inevitably a broad range of stands and supports have been produced to cater for this requirement.

With loudspeaker stands there seems to be two

broad schools of design. The most common is the open frame type which uses square section steel tubing (usually less than an inch square) made up to form a tripod or quadropod stand usually fitted with spikes top and bottom to ensure good coupling to both floor and cabinet. However, for reasons of domestic harmony this latter option is often not pursued as eagerly as perhaps it should be. The alternative approach is to use mass. Larger section (approximately 3 inch x 2 inch) tubing is welded between square top and bottom plates and filled with sand and/or lead shot. Again, this type uses

spikes at the base but Blu-tack or the like for coupling with the speaker cabinet.

Equipment supports generally place isolation quite high on the list of priorities and usually use a lightweight steel frame to support an MDF platform. Once again spikes are used to minimise contact with the platform and ensure good coupling to the floor. Minimising weight without compromising rigidity seems to be the aim with turntable supports but those designed for electronics often employ some form of damping to kill vibration, sometimes in the form of mass.

LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Apollo A820 £40	4 leg Fair	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Apollo A10 £47.25	4 leg Fair	A robust and lightweight model, it would make an ideal upgrade for those still happy with the big boxes of old.	19 x 19cm 44cm	R	58
Foundation Fred £65	2 leg Average	With sand filling the Freds made speakers sound tight and coherent with a more even balance.	19 x 19cm 36/43/59cm		58
Foundation Maggi £159	Pair Very Good	Made for Magneplanar and other similar panel speakers they seem to have a healthy effect on the sound quality thereof.	50 x 2cm 2cm	R	58
Foundation Pi £250	2 leg Very Good	Overpriced in material terms the Pi nevertheless has a very positive effect on the low frequency performance of conventional speakers.	20 x 20cm 25/38/46/53cm	R	58
Heybrook Point 5 £50	3 leg Very Good	An unusual triangulated open frame stand that can help certain speakers sound more transparent and fluent - a good value stand.	23 x 21.5cm 47cm	BB	58
Heybrook HBS1 £75	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speaker's 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 IS1 II £45	3 leg Good	Suited to low mass speakers, preferably using spikes to effect coupling, they sounded slightly 'jazzed up' but the overall sound was quite unuddled.	18 x 15cm 56cm	R	58
Origin Live £117	3 leg Good	An unusual tripod stand devoid of top plate and taking up more floor space than normal, subjective and technical performance was exemplary.	(support area) 22 x 17.5cm 52cm	R	58
Partington PP4 £50	1 leg Good	The PP4 offers a rather mixed performance, though when damped with sand infill it was less ready to embellish the overall sound and low frequencies became tauter and quicker.	18 x 16.5cm 48cm		58
Partington Dreadnought II £120 (filled)	1 leg Very Good	Ideal for systems on the light/bright side of neutral, the Dreadnought II's 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 TCS5 £50	Table Very Good	A little too close to the ground for comfort, perhaps, but this novel and stylish little table is certainly worth seeking out.	29 x 43 x 33cm	R	57
Cornflake TCS6 £50	Shelf Good	A squat and rigid frame supports a Medite top board with four adjustable spikes, better suited to suspended sub-chassis turntables.	43 x 23 x 33cm		57
Deltac Isolation Base £135	Platform Good	Designed for all CD players, amplifiers and separates, but not suspended sub-chassis turntables, the isolation is second to none.	50.5 x 40cm	R	57
RATA Model A £125	Table Very Good	A three-legged Torlyte turntable support that has become something of an industry reference.	46 x 46.5 x 38.5cm	R	57
RATA Amplat £40.25	Platform Very Good	A lightweight and rigid Torlyte slat with spikes for floor or shelf mounting, it works well in conjunction with the Target TT2.	4 x 44.5 x 35cm		57
Sound Organisation Table £55	Table Very Good	A deceptively simple structure that just happens to be engineered in a thoughtful, and ultimately successful manner.	37 x 45 x 35cm	BB	57
Sound Organisation Wall Stand £40	Shelf Very Good	The first of its ilk and still amongst the best, this simple framework represents a vast improvement over standard furniture shelves.	27.5 x 43 x 35cm	BB	57
Target TT1 £46.50	Shelf Excellent	This rigidly braced shelf offers both good sound quality and material value for money.	26 x 46.5 x 35.5cm	BB	57
Target TT2 £47.50	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'.	52 x 46.5 x 35.5cm	BB	57
Townshend Suspension Base £145	Platform Fair	Designed to complement the Rock turntable, this platform will bring subjective improvement to a wide range of electronics.	43 x 36cm	R	57

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THE DIRECTORY

CABLES AND CONNECTIONS

Although cables and connections are sometimes thought to be the least important items in an audio system there has been a growing awareness in recent years that they have a significant effect on sound quality. To this end there is now a vast array of exotic cables and interconnects available to those interested in experimentation. The key observation on cables is that they are much more than mere accessories. Carrying the audio signal, just as an amplifier does, it's really not too surprising that they can influence the quality of that

signal.

The characteristics of any cable are determined by the materials and topologies utilised in its construction. The purity of the conductor, nature of the insulator/dielectric, mechanical construction, physical geometry, RF characteristics, efficiency of screening and finally the connectors themselves, all play vital roles in the sonic character. These factors tend to vary more with interconnect cables which are used to carry the signal between active components like pre and power amplifiers. The

interconnects summarised here were tested in 1m terminated lengths and therefore the results and prices relate to that length – some cables may well perform differently when used in longer lengths.

The features column contains information on the material make-up of the different cables with the following abbreviations: OFC – oxygen free copper, OFHC – oxygen free high conductivity (Audionote define the HC as high crystal), PC-OCC – pure copper by ohno continuous casting, LC-OFC – linear crystal oxygen free copper.

INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Apature LSD N/A in UK	Poor Fair	Faint resonant boom was audible at very low frequencies, but otherwise this cable sounded remarkably neutral.	Silver plated copper, PTFE dielectric		59
Audioquest Reference 2 £29	Good Fair	Ultimately Reference 2 simply damped much of the atmosphere and emotional charge of a musical performance.	OFC copper		59
Audioquest Livewire Topaz £29	Good Fair	Sounding 'bigger' and faintly richer than Reference 2, Topaz was also slightly grainy at the top end.	Gold-plated plugs, OFHC copper		59
Audioquest Livewire Ruby £45	Fair Good	Smoother sounding than the Topaz, the extended crystal Ruby is less grainy and coarse, better able to resolve complex passages.	FCL copper twin axial	R	59
Audioquest Livewire Quartz £65	Good Good	Quartz has an ideal, neutral balance that embodies sparkling clarity without the drawbacks of harshness or compression.	3 piece plugs, PTFE dielectric	R	59
Audio Technica AT6115 £50	Very Good Fair	This cable sounds somewhat 'quieter' than the original LC-OFC interconnect, but is also less transparent and three dimensional.	PC-OCC copper coaxial		59
Audionote Copper ANC £35	Fair Good	ANC sounded punchy with a faintly lean but tightly-focused bass character. This crystalline precision waned slightly at higher frequencies.	OFHC copper twin-axial	R	59
Audionote Flexible Silver ANS £85	Fair Good	ANS scored a hit with its transparent midband and revealing but quite unforced treble quality. Bass transients were slightly softened.	Silver signal & Copper screen	R	59
Audionote Silver ANV £140	Poor Fair	Fair weightier-sounding than the flexible ANS, ANV interconnect also possesses a fair degree of treble clarity and sparkle.	21 strand silver Litz		59
Aural Symphonics N/A in UK	Poor Good	This cable enjoyed an open and transparent midband and sounded remarkably neutral and faithful to the source.	OFC copper PTFE dielectric	R	59
Budget Patch Cords see text	Fair Poor	As thrown in gratis with cassette decks and the like – frequency extremes were restricted and performances were veiled.	Thin coaxial		59
Budget OFC circa £7	Fair Fair	Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.	OFC		59
Deltec Slink £32	Good Very Good	Ideally used in lengths of under 4 metres, it errs on the lean side of neutral but has an uncommon transparency in the midrange.	4 silver plated OFC strands PTFE dielectric	BB	59
Deltec Black Slink £152	Excellent Excellent	Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of tactility.	8 silver plated OFC strands PTFE dielectric	R	59
Denon LC-OFC N/A separately	Very Good Fair	Supplied with Denon's dearer CD players this cable introduced a peculiar 'twangy' coloration at high frequencies, and a slightly soft bass.	LC-OFC, non-magnetic gold plated plugs		59
DNM Solid-core £15-£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 £37.5	Good Very Good	Treble detail resolution was perceived in a slightly abrupt if wholly controlled fashion. Depth re-creation and lateral separation were excellent.	Multi-gauge silver, PTFE dielectric	R	59
MDM Interconnect £14.95	Good Fair	The subjective performance of MDM did appear a little imprecise at the frequency extremes, but a worthwhile upgrade on budget interconnect.	Coaxial, solid core, gold plated plugs		59
MIT PC-Squared £75	Fair Good	This multi-gauge cable produced a very open and buoyant midband but sounded slightly 'peculiar' at frequency extremes.	OFC, multi-gauge	R	59
MIT Spectral MI330 £193	Poor Fair	MI330 displays a marvellously open and enticing midband quality, bass is warm and rich but this character has a tendency to dominate.	Multi-gauge balanced bandwidth		59
Monitor PC 0100381 £17	Good Fair	There is more than a hint of instrumental muddling and bass is slightly soft, however, the slightly 'shut-in' sound is par for the course at the price.	OFC, coaxial	R	59
Monster Interlink 400 £30	Good Good	Bass is solid and punchy, counterpointed by a slightly overblown midband which tends to make vocalists sound larger-than-life.	Multi-gauge	R	59
Monster Interlink CD £44	Fair Fair	Low frequency is commendably weighty, but the top-end sounds vague and lacking in image focus. Suited to some systems better than others.	Multi-gauge		59
Monster Interlink Reference £88	Good Fair	Protracted listening indicated a lack of dynamic speed – a subjective sluggishness. It may prove well suited to up-front systems.	Multi-gauge Balanced bandwidth Gold plated plugs		59
Myst Tm £15.60	Fair Good	Fairly neutral with a pleasantly open and transparent midband. Some deep bass detail is lost but treble is sharply focused.	Solid-silver PTFE dielectric	BB	59
Origin Live Soli-Core Super £60	Good Fair	Improves over previous Soli-core samples in stereo depth and bass weight, but a 'loud' treble presentation remains.	Solid-core gold-plated AT plugs		59
QED Incon P1-Gold £14.95	Good Good	A lively open presentation that just borders on the lean side of neutral, the quick and lucid delivery affording considerable musical insight.	OFHC, gold plated Deltron plugs	BB	59
QED Incon Graphite GP1 Gold £18.95	Fair Fair	A shielded version of Incon P1, it sounded thicker at the frequency extremes, the top end being coarser and more out of focus. Good for long runs though.	OFHC Graphite shielding	R	59
Sony RK-C310ES £40	Excellent Good	Possessing deep firm bass and a sparkling top end it offers a balanced perspective with negligible coloration.	Coaxial LC-OFC	R	59
Sterling £250	Fair Good	Possessing a neutral if faintly rich overall balance it supplies a pleasantly open and transparent perspective. (Reviewed in pre-production form.)	2 silver strands per conductor		59
Thorens SAC 100 £50	Good Fair	Performance is undermined by a slightly coarse and splashy treble, not necessarily bright, simply rather confused – and fine detail lacks resolution.	Silver-plated OFC, coaxial		59
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

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INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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 muddying 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 'fizzy' 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

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 DR-200 £16 per metre	Fair + Fair +	Open and detailed throughout the midband but a grainy coloration tended to corrupt subtle timbral information at very high frequencies.	200 LC strands, polyurethane and cotton dielectric		64
Audionote AN-SP £100 per metre	Average — Good	A clean and open sounding cable that offered a deep and pleasantly detailed perspective. Bass was slightly restricted, but seemed tight and coherent nonetheless.	15 silver strands, polyethylene dielectric		64
Audioquest BC-4 £2 per metre	Average + Good +	There was a slowing of fast transient edges to contend with but in general BC-4 offered a delightful clarity and sparkle throughout the highest octaves.	4 OFC 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.	0FHC, surface only — foam core construction	R	64
Audioquest Livewire Green £30 per metre	Good Fair +	Green proved more overtly dynamic and forward than BC-4 with simple music, but complex passages tended towards a mushy and ill-defined perspective. FCL — functionally crystal less.	FCL, surface only — foam core construction		64
Audio Technica AT6120 £95 — 10m	Fair + Fair	Compared to earlier LC-0FC cables this PC-0CC derivative sounded smoother and less aggressive.	PC-0CC, PVC dielectric		64
Bellwire 12p per metre	Poor Average —	Broadly speaking, it delivered a bright and 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		64
Exposure £2 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs.	56 OFC strands, webbed PVC dielectric	R	64
Kimber Kable 4PR £49.45 — 5m pair	Fair Fair +	This directionally marked cable benefitted from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut.	4 x 7 copper strands per conductor, PVC dielectric		64
Kimber Kable 4TC £16 per metre	Good Good +	4TC made a great impression in the listening tests with an open midband, a smooth and unflagging treble with slightly rich but suitably weighty bass.	OF copper, PTFE dielectric	R	64
Linn K20 £2.20 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 unflagging treble balance with loudspeakers offering an easy load.	0.8mm single strand, PVC dielectric	BB	64
Monitor PC Silverline PC4 £5.75 per metre	Good Average	Sonically it laboured under a heavy and claustrophobic balance, lacking the see through transparency and lucidity of the better solid core cables.	2072 x 0.07mm silver plated copper strands		64
Monster Superflex £2.50 per metre	Fair + Fair +	Treble detail was both reserved and confused though there was little in the way of harshness and grain. Deep bass notes were also found to be lacking.	OFC, multistrand, Duraflex dielectric		64
Monster Original £4 per metre	Good Fair +	Original sounded relatively congested and murky at higher frequencies but possessed weight and conviction in the bass.	Multistrand		64
Monster Powerline 2 £12 per metre	Good Good —	Powerline stamped its own hallmark on the sound with a strong taut bass and an essentially clear midband giving tactile stereo images.	Multistrand, helical construction		64
Musical Fidelity Lifeline £11.50 per metre	Fair Good —	Lifeline did demonstrate a strong directional inclination, affording a laid back but fairly neutral balance when correctly oriented.	4 x 0.8mm PC-0CC strands	R	64
Naim NAC-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.	0FHC, polymeric screen		64
QED Flat 200 £1.95 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive.	200 strands, flat webbed PVC dielectric	R	64
Rotel Supra 4 £2.49 per metre	Good + Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unflagging treble.	1,036 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 10 £6.49 per metre	Good + Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Sony RK-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

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THE DIRECTORY

LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Sterling £499 - 5m pair	Fair Fair	This pre-production sample possessed a strangely muddled and reserved sound quality. It suffered from a progressive instrument modulation that totally confused more complex orchestral passages	Pure Silver, PTFE dielectric		64
Townshend Isolda £400 - 5m pair	Fair + Good	Isolda possessed a truly dark background out of which rose a very solid and extended bass together with an excellent sense of transparency through the upper octaves	8 coax cables per conductor - very thick	R	64
van den Hul CS-122 £5.50 per metre	Fair + Good -	Characterised by a driving and powerful bass, CS-122 proved to be a heavy sounding cable. Mid treble detail was refreshingly clear but there was a slightly muted air about the extreme treble	19 x 0.45mm silver plated strands, webbed rubberised dielectric	R	64
van den Hul CS-352 £12.95 per metre	Good Fair +	Subjectively it sounded like CS-122 only more so, the deep rumbling bass tending to overwhelm subtle musical details. It also appeared a trifle peaky in the treble	7 x 0.76mm + 168 x 0.125mm silver plated strands, rubberised dielectric		64
van den Hul SCS-12 £29.95 per linear metre	Good + Good +	SCS-12 set a high standard with a tight and well focused soundstage populated with tactile stereo images. Bass wasn't as extended or resolved as some other cables	19 silver plated strands of 12 different gauges, PTFE dielectric	R	64
van den Hul SCS-2 £99.95 per linear metre	Good + Good +	Overall it was commendably neutral and transparent but nothing less would be acceptable bearing in mind the tremendous cost of a stereo pair	665 silver plated matched crystal copper strands, PTFE dielectric	R	64
Vecteur R-CV30 £4.99 per metre	Fair Good	Subjectively the better of Vecteur's three-strong cable line-up offering a neutral overall perspective but with a slight loss of detail resolution at both frequency extremes	4 x 0.8mm LC-0FC PTFE insulated strands	BB	64
Vecteur S-CV90 £1.99 - 5m pair	Fair + Fair +	It seemed both less transparent and integrated throughout the midband than R-CV30, though both frequency extremes were smoothed up with a tighter sharper delivery	6 x 0.7mm LC-0FC strands		64

IN-CAR ENTERTAINMENT

In-car entertainment is an area not usually associated with the esoteric world of domestic hi-fi. However, it represents a source of musical entertainment that many of us are exposed to every day. The majority of new cars are fitted with some form of radio before they leave the showroom and in many cases this usually very basic player is taken for granted and accepted as representative of in-car audio standards.

For the price of a budget amplifier or more, there is a wide variety of in-car machines to choose from,

including cassette, CD and even DAT players. The majority of sub £300 players are integrated units featuring a cassette player, AM/FM tuner and amplifier, all in one remarkably compact standard sized box. At this price level the cassette players tend to be fairly basic affairs, although autoreverse and noise reduction systems are both fairly common. Tuners are usually of the digital variety with varying degrees of sophistication in signal tuning and presetting, with some machines featuring as many as 18 FM presets. The emphasis is on the frequency

modulated band and AM often suffers as a consequence, but fortunately for radio enthusiasts there are some exceptions.

The amplifier is usually designed to drive two pairs of speakers mounted fore and aft of the vehicle, and a fader is fitted to adjust the balance between the two. The dearer machines feature separate bass and treble controls which can be quite handy given the unusual acoustic of the car environment and the variety in balance and presentation to be had from car speakers.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Alpine 7282L £250	Good Very Good	A very attractive and seductive sounding player. The matt surfaced transparent preset keys are especially sexy	Bass/treble controls, 12 FM 6 AM presets, chrome eq., clock, 8W	R	61
Alpine 7905M/3539 £650/£350	Excellent Excellent	An easy to use and attractive CD/tuner, partnered with a powerful and flexible amplifier to give an effortless source of in-car entertainment	Bass/treble controls, 12 FM, 12 AM presets, slide-out, 150W	R	68
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 Excellent	If you want your in-car entertainment to compete on sound quality grounds with your domestic system, this combo offers a very strong challenge	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, chrome eq., Dolby B, C, 75W	R	62
Nakamichi TD-700E/PA-300II £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/CDX-M100/ GM-3000 £300/£450/£280	n/a Very Good	Separate control unit and boot mounted multi play autochanger make this a bit of a hefty installation but it uses the same magazines as their domestic players and sounds fine	Bass/treble controls, 18 FM, 6 AM presets, 80W, removable fascia		68
Proton 214CD/D275 £300/£175	Very Good Very Good	This Proton cassette/tuner offers good power and a level of fidelity appropriate to its price. Musically it has a Decca-like charm that is very appealing, plus a sensitive radio	Bass/treble controls, 8 FM, 8 AM presets, Dolby B/C NR, chrome eq., 85W	R	68
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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THE DIRECTORY

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 converter 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

Yet another loudspeaker finds its way to Paul Messenger's door. This time the new Rega ELA gets a welcome.

Whatever my original intentions, this column seems fated to concentrate on loudspeakers to the virtual exclusion of other products. I did my best to get a new Rega amplifier in this time, but was informed that neither the 'breadboard' example I rather enjoyed, nor the decision to go ahead were yet finalised, and that production could be as much as a year away. So for the nonce I must be content to point out that new Rega products are as interesting as they are rare.

That last statement certainly applies to the new £405 Danish-made *ELA* loudspeaker. It's not Rega's first loudspeaker, but it is the first for many years, and follows the company tradition in offering remarkably good value – certainly I was surprised to hear it cost less than £500.

Designwise the *ELA* follows in the footsteps of the earlier Rega loudspeaker, but the brew is liberally laced by an unmistakable Royd *Eden* influence. Rega tradition bequeaths the transmission line bass loading technique, a Scanspeak tweeter, an ultra-simple crossover and a lightweight paper-cone bass/mid driver, but the detail differences are nevertheless substantial.

Whereas the original was a chunky shape with a three-section tapered Bailey line terminating in the base, *ELA* is a slim, floor-standing design with just the single fold and high rear port. The considerable muscle and expertise of the Danish distributor/manufacturer has been used to create a unique version of the respected Scan tweeter.

And whereas that earlier, larger design used a 200mm main driver sourced from Mordaunt-Short (made famous in the highly successful *Pageant 3*), the *ELA*'s main driver shares cone and chassis with the latest loudspeaker to achieve cult status – the redoubtable *Eden*.

Rega MD Roy Gandy certainly helped encourage Royd MD Joe Ackroyd to produce the *Eden* in the first place, which explains the driver connection. There is also a reciprocal arrangement which involves Royd using Rega's transmission line cabinet design, less as UK rivals than to cover the company's various overseas

markets more effectively. This Royd *Apex* is not yet available in the UK, though it's expected to cost £485 and include bi-wire/amp terminals and real wood veneer. The main driver and crossover designs are different too – and so by implication will be the sound.

The sides of the tall, slim *ELA* enclosure taper towards the top, so the front baffle leans backwards, and this tends to minimise the impact of cabinetwork which is otherwise quite assertively finished. Particularly the baffle, which is thick, black MDF with heavy and irregular deep grooving – an unusual (unique?) technique which is claimed to reduce the 'focusing' effect caused by specific baffle edge distribution discontinuities. It's available in black only and I want a white pair for the drawing room, so if enough people write to Rega to complain that black is boring, we might just get lucky. The whole thing sits on a vestigial tri-spike frame.

I have mentioned 'transmission line' bass, without any explanation of this curious hybrid technique which lies somewhere between a reflex, a tuned column and a labyrinth. It became very fashionable 15-20 years ago, partly through the commercially successful IMF *Monitors* (now reincarnated as TDLs, see *Choice* January '89),



but was also hugely popular with DIYers, who could save a lot of money on the highly complex cabinetwork.

The transmission line term derives from basic electrical power transmission theory, the analogy implying that the output from the rear of the bass driver is 'ducted away' down a long tapering tube filled with carefully graduated absorbent so that none is reflected back and there is no pressure build-up to cause distortions. In practice the line is usually terminated in a port, which helps to improve efficiency at low frequencies, and the line length is 'tuned' to match the bass driver's natural resonance.

The successful TL's of the '70s often used the classic KEF *B139* bass driver, which meant a very long line of quite a large cross-sectional area, resulting in truly massive loudspeakers. This runs counter to the one most obvious trend over the past 20 years: the steady shrinkage of domestic loudspeakers has tended to leave the TLs out in the cold. However, the tiny *Eden*-type driver has a much higher resonance and smaller area than the genuine bass units, so the *ELA* finished up taking no more space than a miniature design like the *Eden* on a highish stand.

I was most taken with the *Eden* when I reviewed it not long ago (*Choice* January '88), but the very considerable virtue of a quite remarkable midrange and presence 'speed' was marred by a virtual absence of bass extension and power, and a somewhat unruly treble. It's an uneven performer whose flaws are forgivable because its communicative strengths can match anything available. But they're difficult to ignore for all that.

The strength of *ELA* is that it seems able to provide most of the answers, for an eminently reasonable 50 per cent price premium. The Scan clearly improves on the Royd-modified Vifa of the *Eden* at the top end of the frequency range. The bass performance still falls short of South London standards for Caribbean music reproduction, lacking a certain power and energy, but it's clean, quick and remarkably good considering the tiny little 100mm cone.

The cone flaps around rather alarmingly when over-driven, partly because the optimum magnet power for the design is quite modest, and partly because a line by nature offers virtually no damping below its natural tuned frequency. But I was told not to worry – the speakers had already endured half an hour of hard-clip drive from a pair of Naim *NAP135* monoblocks without suffering any damage.

Stereo performance is impressive on and off axis, and the sound shows no inclination to clump around the enclosures, so I fancy the stripy contoured baffework is making a worthwhile contribution. *ELA* is probably happiest a little away from a rear wall, though is quite tolerant of siting. The sound itself does have a slightly bright overall character, so may be inclined to expose any weaknesses earlier in the chain and will not suit every taste or system. But I doubt if a comparable level of communication is available elsewhere for less than twice the price.

Indeed, going back to my *Isobariks* proved something of a disappointment as far as the (very important) presence band is concerned, *ELA* sounding just as quick and significantly less coloured. Whisper it not amongst the Glens, for fear of stirring controversy, but I am currently contemplating undertaking a midrange transplant operation, replacing the four KEF *B110s* used in the *bariks* with a quartet of *Eden/ELA* type drivers. (I'm not too handy with a router, and haven't quite built up enough bottle to take a probably irrevocable step yet.)

This highlights both the strength and the fundamental limitation of *ELA*. The 'performance envelope' provided by a small main driver – transmission line or no – does limit the loudness capability and welly factor. Analogies like rapiers and broadswords spring to mind. Of two live concerts attended recently, I would choose *ELAs* for reproducing the Gabriellis' Grand Ceremonial Music for the 1595 Coronation of the Doge of Venice (thank you Technics), but would have to go back to my *bariks* for Little Feat.

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