

HI-FI CHOICE

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

APRIL 1990 £2.95

RECORDABLE

IT'S HERE – BUT YOU
CAN'T AFFORD IT!

CASSETTE DECKS

20 MODELS ON TEST

FREE!

STYLUS CLEANER

OVER

950 TEST

SUMMARIES

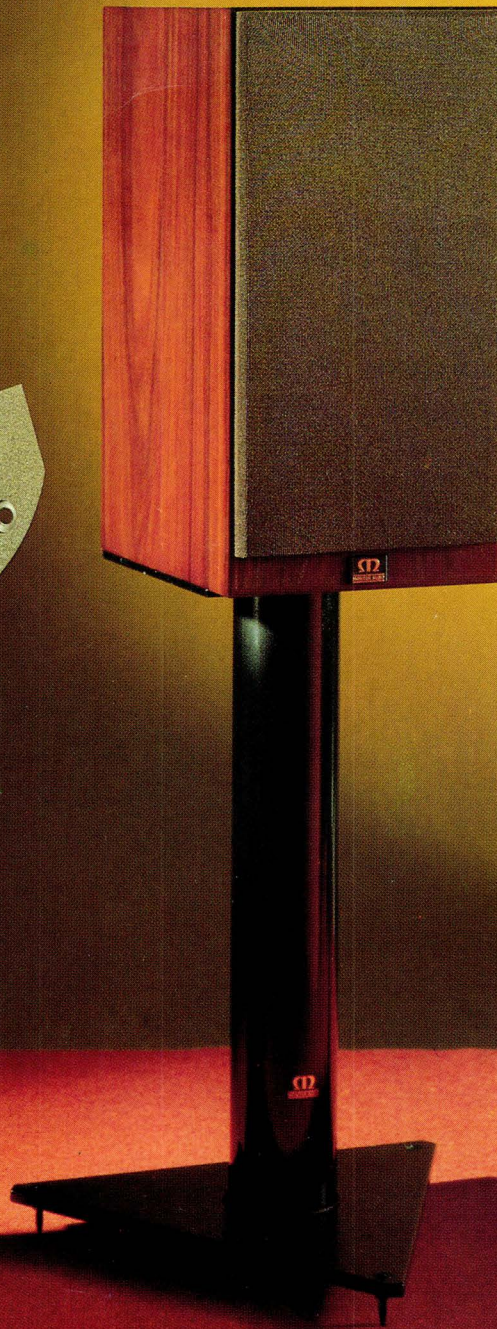
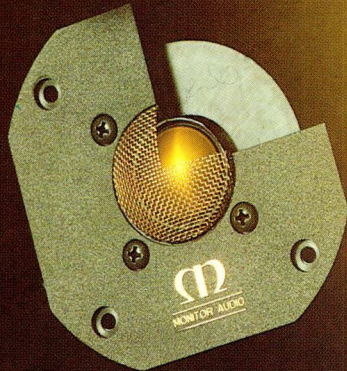
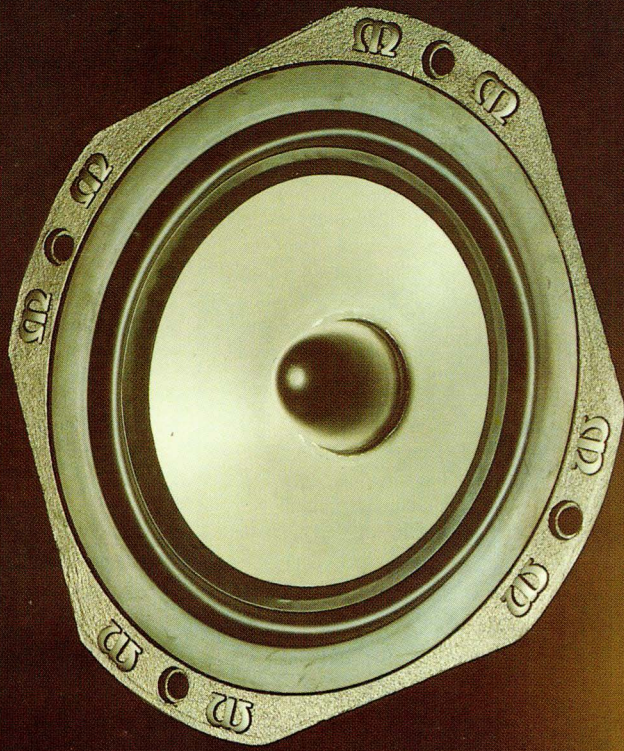
IN THE CHOICE
BUYER'S GUIDE

ISSN 0955-1115



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MENU

In case you hadn't noticed, the major topic of discussion in hi-fi circles at the moment is 'bitstream' digital-to-analogue conversion. The technology inside today's compact disc players is changing rapidly. They all play the same CDs, but the method by which the digital information on the disc is decoded to analogue sound is now vastly different from player to player, depending on the type of DACs (digital-to-analogue converters) employed.

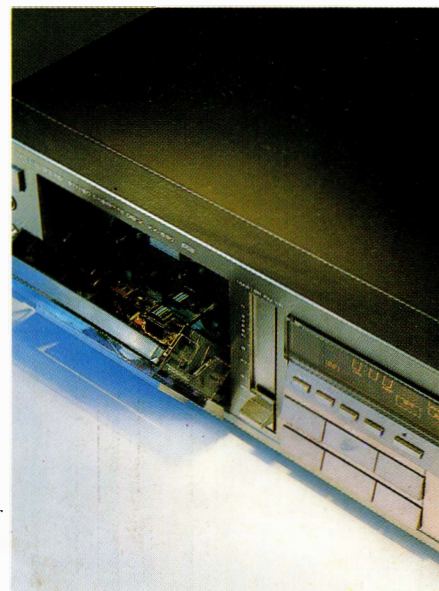
A year ago we were being told 'the more bits the better', with some 16-bit players claiming to offer 18 or even 20-bit resolution. But today's trend is to use new 'low-bit' or 'bitstream' DACs which have been developed both by Philips and Technics. We explained in last December's *Choice* the differences between Philips' PDM and Technics' PWM D-to-A converters; this month we've been able to compare four components (three CD players and one outboard converter) which all employ the Philips PDM system. You can read all about them, starting at page 30.

Looking to future technology, whatever happened to recordable CD? While the world's leading hardware manufacturers might prefer consumers to believe that CD-R is still being developed, you've only to go to Japan to discover that CD-R is alive and well and readily available – if you can afford the asking price! *Choice* was surprised to discover a CD-R system up and running in a London recording studio just a few weeks ago. Our *Perspectives* report begins on page 40.

While hi-fi buffs might wrinkle their noses at the compact cassette medium, cassette decks continue to be ever popular in all manner of systems. Alvin Gold has been assessing 20 new models for this month's *Choice*, at prices to suit all pockets. Also with this issue we're giving you a **free** 'matchbook style' stylus cleaner – outrageously simple, but extremely effective nonetheless! Keep it next to your turntable and it will remind you to keep your stylus clean at all times in order to preserve your increasingly valuable record collection.

As we go to press we're just getting ready to trek down to the Bristol hi-fi show. Meanwhile our May edition is well under way: we've 22 loudspeakers on test, a free-to-enter competition to win a fabulous pair of SD Acoustics speakers, plus a music supplement in which we review the major classical records released during recent months.

John Bamford



Cover photograph of the Yamaha KX 630 (see page 85) by Chris Richardson.

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Right: Aspirations is in Wiltshire to see what gets the smart set twisting by the pool.

Below: The Snell Type K in session . . . sounds a lot better than it looks.



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That's marketing. Associate Maserati with your tape and move into a higher gear



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COMING UP

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In a joint venture with Audiofreaks *Hi-Fi Choice* offers its UK readers an exclusive collection of superbly recorded classical and jazz music, from Scandinavia and America.

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Improve the performance of your system with these *Choice*-discounted audiophile interconnects and speaker cables.

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PERSONAL MESSAGES

Paul Messenger re-opens the *Ekos* versus *ARO* debate and dabbles with a bit of black marker pen magic.



Are you in the dark about PDM CD players? Paul Miller offers a torch in Focus.



The Pioneer F-91 and F-656 tuners have been rather well received. So has the A-115 amplifier. Indeed, some people have found it impossible to contain their delight. You're in for a real treat listening to the F-91. Most mid-price tuners are shown up by it, such is the definition and effortless clarity it displays on high quality broadcasts. As for the best

The latest amps and tuners from Pioneer.

signals, on these, quality was at times breath-taking. If you're serious about FM stereo you can't afford to overlook the F-91. JONATHAN KETTLE, NEW HI-FI

Apparently, some people quite like them.

SOUND, FEBRUARY 1988. At £200, the Pioneer F-656 represents a great buy, maintaining Pioneer's tradition. Fed a good clean signal from a high quality multi-element aerial the F-656 can really sing. Its subjective performance is well-balanced, neither bass heavy nor too bright but neutral, transparent and musically satisfying. The F-656 remains an exceptionally quiet sounding tuner for the price.

WHAT HI-FI AWARDS, DECEMBER 1989. (WINNER, BEST TUNER UNDER £300.) The Pioneer A-115's performance is as guileless as its construction.

Its sound isn't engineered down as is the case with some other low cost amplifiers. In the Pioneer's case, we have an



amplifier that tries to do everything on a

grand scale sometimes sounding like a much more expensive



amplifier than you'd expect. ALVIN GOLD,

HI-FI ANSWERS, SEPTEMBER 1989. It seems, then, that they have



already brought a few smiles to a few faces.

Have a listen yourself and there may well be a few more.



UPDATE

PRODUCTS

DYNAMITE WITH A LASER BEAM?

It's here. The long awaited Finial *Laser Turntable* has arrived in the UK complete with a price tag of £20,000. The *Laser Turntable* reads conventional 12-inch vinyl records with a laser beam which avoids wear, and so preserves irreplaceable record collections. While much of the microprocessing is digital, sound reproduction is entirely in the analogue domain.

The project has taken eight years from conception to completion and regular readers may remember the Finial *LT* being cancelled just days before its launch in January last year. The *LT*'s price has also rocketed – from a reasonably affordable \$2,500 in 1986 to \$32,000 now. Acoustic Gold, which is the only outlet in the UK and represents Finial in Europe is asking Europeans to pay according to whatever their country's current exchange rate is with the US dollar.

Dennis Wratten, for Acoustic Gold, explained that the soaring price of the laser turntable had been both unexpected and unavoidable. The research and development bill, which stood at some \$6m last year, had risen to the point where the project wasn't commercially viable in the States. The *LT* is now hand-made in Japan in a joint venture with Finial's parent company Carillon Technology. "One of the reasons it took so long to develop is that there are so many variations in the way LPs are cut," said Wratten. "There are differences in groove width, groove excursion (that's the total movement of the grooves), the bandwidth between the grooves, and the angle of the groove walls. When all these were taken into account Finial discovered there were enormous variations which were outside the industry standards. The problem was how to make the thing play virtually every record. The first demonstrations were done in June 1986 and the technology is essentially similar."

Wratten also warned that the



Finial's \$32,000 laser turntable: Not available in the High Street. And below Kenwood: Opting for ergonomics and large knobs.

LT is still finicky with dirty records. "Records have to be scrupulously clean, there is no way of getting round that and so there's a certain tweakishness built in; you'd need to buy a record cleaning machine such as a VPI or Nitty Gritty. Even new records sound a bit noisy and benefit from a clean." (So don't forget to add a further few hundred pounds to the total for a decent record cleaner).

However, with a clean record playing, the machine is said to deliver superlative sound quality.

As Wratten explained, the Finial side-steps many of the problems other turntable manufacturers have striven to overcome. "Because there is no contact with the record there is no rumble, no wow and none of the problems associated with a stylus' friction in the groove," he said. The system will also please audiophiles who dislike sound from digital sources – the laser reads the pattern of angles from the side of a record groove and transfers them to a photocell which generates a current according to the intensity of light received. None of the information retrieval is done

digitally.

The advent of the Finial will do little for a vinyl revival; CDs now outsell LPs and many new releases are only on tape or CD. Neither will it come down in price nor spawn a host of rivals. "Who else is going to spend \$10m on research and development?" asks Wratten. (Although the first 300 apparently have been ordered – which pays off most of this sum.) Instead it aims to be a state of the art record player which never touches your collection. And individuals or institutions who can put up with the cleaning aspect may find it invaluable for preserving their vinyl archives. *Choice* hopes to give readers a full feature in the near future.

TECHNOLOGY

FRONTIER TAPE

Yet another alternative recording medium to the established compact cassette is in the offing. Sony has given us details of its ultra-compact Digital Memo-Recorder (*DMR*) which will use tapes the size of a postage stamp (special issue). The size of the

recorder itself has not been released but we presume it will be comparable to, if not smaller than, existing micro-recorders. The *DMR* pioneers new technology in the recording field.

In a similar way to a DAT player or VCR the tape head spins and is shaped like a drum. However, *DMR* is both a non-loading and non-tracking system. The tiny cassettes (30 x 21.5 x 5mm) incorporate their own guide pin and pinch roller and therefore do not require a tape-threading mechanism. This saves the loading time taken by DAT (digital audio tape) machines where the tape has to be passed and held over the convex face of the drum. The non-tracking (NT) system allows the head to be less accurate than those in DAT or VCR machines which use rotary helical scanning.

Playing back with NT is done at twice the speed of recording and different blocks of information are read. The data picked up in this double-scanning method is then sorted and combined in a semiconductor memory. The NT system has also allowed the tape loading to be simplified and the new developments complement each other.

Sony says its Digital Memo-Recorders should be in commercial shape (probably only in Japan at first) by the end of 1990. The medium is being aimed at the news-gathering or conference application but with Sony claiming a frequency range between 10 and 15,000Hz it may well have some high-fidelity appeal.

As such it would no doubt join DAT, recordable CD and Dolby S as viable alternatives or improvements to the audiophile cassette deck, and it will be interesting to see whether the record industry, fearful of new quality recording media, will try to block its use in the domestic field.

PRODUCTS

DESIGNS ON THE MARKET

Kenwood is building upon the

success of its products in the midi system market with a range of stylish and (fairly) unaffordable new separates. While not strictly 'high-end' the pre-and-power amplifier, CD player and tuner in the 'L1000' Series adhere to an ergonomic and minimalist approach characteristic of expensive hi-fi; they are the new flagships of the brand.

The range has been designed with matching fascias in heavy diecast zinc and boasts solid construction with attention to vibration damping. The L1000D CD player is a £700 model offering twin 16-bit 4x oversampling performance with a digital pulse axis control. Optical and co-axial digital outputs cater for different types of interconnect cable. The fascia looks simple, with only the most basic functions on show – everything else is done with the remote control handset. This handset also operates the amplifier and tuner. At £500 L1000C is the pre- or 'control' amplifier which is equally simple in terms of design. Source selection is shown on an array of tiny lights next to the 'pot', and the bass and treble controls can be by-passed for a purer signal path. It is complemented by a £700 stereo power amplifier (L1000M) which boasts features such as two transformers, gold plated inputs and internal isolation between left and right channel interference.

Mix and match cabinets from Twist.

The tuner joins the rest of the line-up in May. At £600 L1000T is an FM only type with 20 station presets and such audiophile features as a distortion correction circuit and 'auto quieting control'.

Kenwood's L Series is part of an entirely new line-up of separates for 1990. No less than seven CD players, two tuners, six cassette decks, a turntable, a graphic equaliser and a brace of receivers (tuner/amps) all join existing product to plug possible price gaps or consumer wishes.

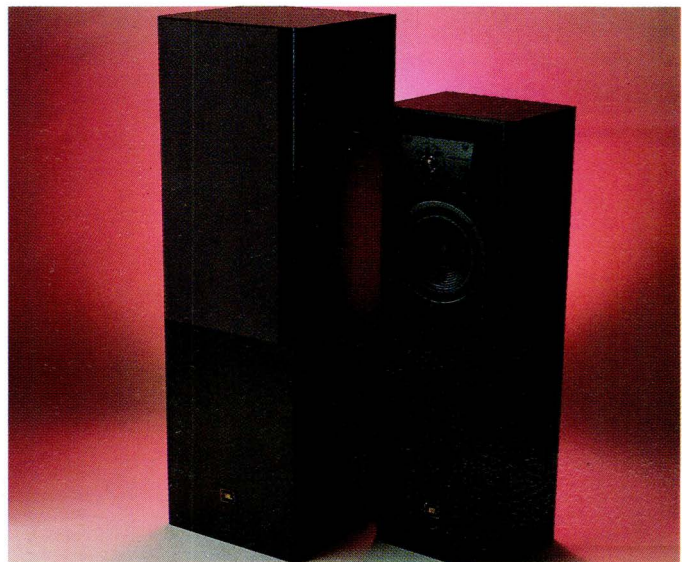
THE REAL THING?

"It is the result of three and a half years of almost fanatical research and development by an individual whose entire life has been devoted to the recreation of music." So reads the press release on ATC's new two-way compact loudspeaker – the £1,320 SCM 20. The individual referred to is Bill Woodman, the firm's managing director and design engineer. Mr Woodman's firm's products have been making many recording engineers sit up and take notice but so far have enjoyed only a small segment of the domestic hi-fi market.

It's unlikely that the SCM 20 will take over the world for ATC but the unit will certainly be of interest to audiophiles. ATC



ATC's compact monitor in topless pose.



JBL's new speakers... a rosy future?

promises the highest levels of performance and faithful sound reproduction with a compact unit measuring just 44 x 24 x 31cm. The speaker's drive units are a Danish-made 25mm damped-fabric tweeter used in ATC's other compact models, and a 165mm mid and bass driver using ATC's own three-inch diameter voice coil claimed to give much superior power handling of the transients in music.

The box is massive, made of 18mm thick veneered medium density fibreboard lined with 6mm of bitumastic sound deadening pads. The baffle is 36mm thick and each unit weighs 50lbs. "It is a very exciting development," Ashley James commented for the firm, "the majority of small hi-fi loudspeakers lack any clarity because they don't have enough power handling, whereas this can instantaneously cope with the changes in music. It also has very wide dispersion and is 6dB louder than its nearest rival."

TWIST AGAIN

The 'hi-fi-should-be-heard-but-not-seen' brigade will leap at the chance to acquire Twist Acoustics' omnidirectional loudspeaker which has chameleon qualities. The £460 Puccini radiates 360-degree sound through apertures in the

cabinet. The two-way unit features a one-inch fabric tweeter and four-inch bass driver to deliver a claimed frequency response of 70Hz-20kHz and a sensitivity rated at 84dB. It prefers an amplifier rated between 25 and 100 watts.

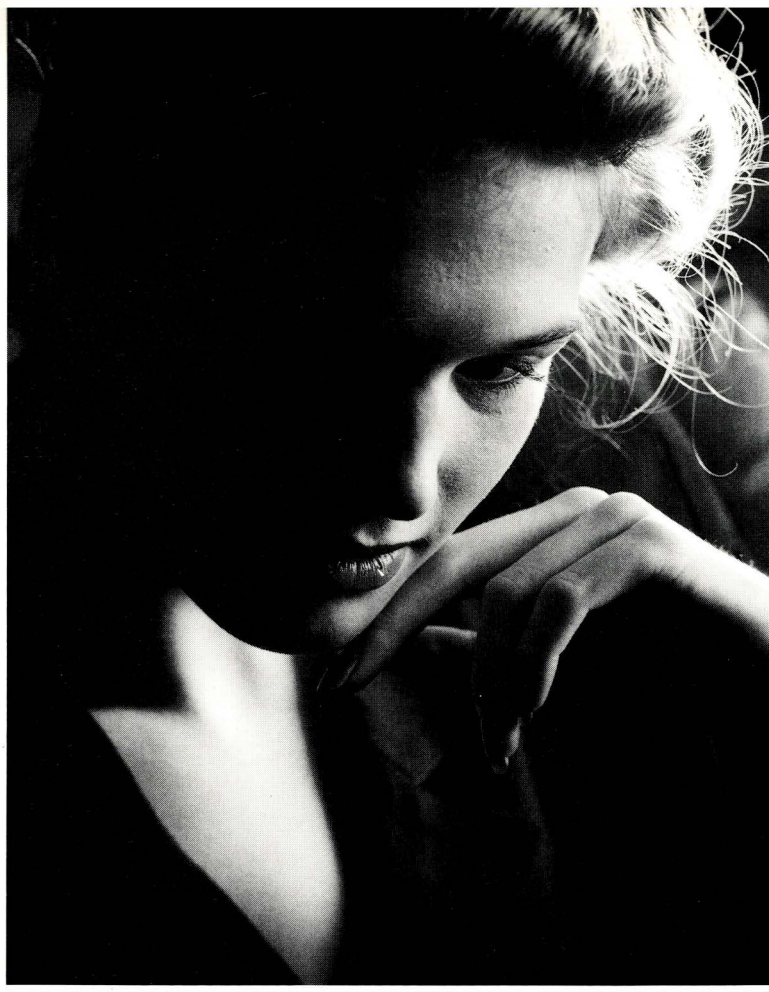
But the main feature is its get-one-on-the-Joneses style; the Puccini can be sited anywhere in the room – even behind the sofa. It comes ready to be finished by 'artists or decorators' or you can choose from a range of house styles, including real wood veneers and lacquer finishes.

Puccini is one of a range of specially finished loudspeakers from Twist which includes Schubert – a Bookshelf model (from £275), the £525 reference monitor 3/5X (whoever heard of him? – Ed), and Mahler – the most expensive at £2,950, and a three-way design built to recording industry standards.

Twist Acoustics, Balham, S London. 01-675 0335.

EXTRA BASS

More bass and power handling are the promised properties from a couple of new models from the JBL (Jolly Big Loudspeakers?) company. LX33 and LX60 are priced £259 and £459 respectively and complement two existing models in the LX range – the LX22 and LX44. In



M A R A N T Z.
N O T F O R T H E
C A S U A L
L I S T E N E R.

You don't buy Marantz hi-fi to hear music. You buy it to listen. To appreciate every aspect, every subtle nuance of sound in a musical piece.

Thirty years ago Saul Marantz said, 'for us the realistic reproduction of music is the essential premise'. These words set the standard that continues to this day.

That's why Marantz still uses its own custom components and technologies throughout the entire hi-fi range. Because it's still the only way to achieve pure high fidelity. After all, there is just one ultimate test of musical perfection - listening.

marantz
PURE HIGH FIDELITY

*SD 50 Full featured, Dolby B.C.
HXPRO audiophile cassette deck.*



fact there is little difference between the *LX33* and *LX22*, or the *LX60* and *LX44* loudspeakers. Bigger reflex-ported floor-standing cabinets create extra bass and power handling is extended by a further ten watts in the new models. Finish is a choice of rosewood or black.

MINIMAL HI-FI

Goodmans is flying the flag for minimal hi-fi with the introduction of the Remote Control *Maxamp* loudspeaker. Incorporating an integral amplifier and 'on-board' infra-red sensor, the £160 loudspeaker will cater for a range of sources without the need for an amplifier first. Its obvious appeal is as a bedroom/study system where space is a premium; it is also described as 'ideal for combination with a stereo television and Hi-fi video recorder to create the complete audio visual experience'. Remote control operations include volume, bass, treble and balance.

DESIGNER TAPE

It seems the Japanese are even more designer-label conscious than style victims in the West. That's tape, made by Taiyo Yuden in Japan, has commissioned the industrial design maestro Giorgetto Giugiaro to deliver the shell shape of its new *Suono* tape. Giugiaro, better known for the lines of a Lotus or Maserati sports car, has also applied his genius to tasks as diverse as pasta in the past (or repast!) and has come up with a shape and material which claims a

reduction in modulation noise.

The shell is made of Suono resin – a mixture of polymer rubber and metal which is heavier than normal cassette shells and is therefore better for controlling vibration. "It feels a bit like latex," suggested a spokesman. A raised dome between the spools also helps to dampen standing waves. *Suono* also uses That's "world's highest grade metal tape" which exceeds the MRX-Pro formulation by 2dB – the company asserts. For your 2dB and designer kitsch you pay a hefty £8 per 90 minutes, nearly twice the price of existing top tapes.

"It does seem a bit much – four quid for an extra 2dB – but people were forking out at the London hi-fi show in February and we sold out," said our spokesman.

BUSINESS

NEW FOR OLD

Bose UK is offering a guaranteed trade-in deal for anyone who wishes to buy a pair of *Acoustimass* loudspeakers during March. The company says it will reduce the price of a pair of *Acoustimass 5s* by at least £100, and *Acoustimass 3s* by at least £50 against your existing loudspeakers. The *Acoustimass* is a satellite and subwoofer system favoured by those who don't like big ugly black boxes.

OLD TIMERS

The Vintage Wireless Company, based in Bristol, has opened a

Saturday shop where buffs can swap stories and kit. The VWC also publishes a newsletter and a 'wanted' sheet listing equipment and prices. Everything has a value, from valves and ancient wirelesses through to the forerunners of hi-fi such as Garrard and Quad classics. VWC, Tudor House, Cosham Street, Mangotsfield, Bristol BS17 3EN. Tel: (0272) 565472.

SHOW REPORT

AUDIO 90 – THE LONDON SHOW

Over a particularly wet and windy weekend last February, Kensington's Gloucester Hotel hosted Audio 90, the first central London hi-fi show for four or five years. The event was organised by retailers AT Labs and managed to attract a good cross section of manufacturers and distributors. Yours truly braved the weather and took his new flash gun along for a first outing. However, the lack of pics in this piece is testimony to the fact that, unlike much hi-fi, it pays to read the instructions with photographic equipment! And, needless to say, there was a good turn out of products to be snapped.

Starting at the front end, two of the most consistently successful turntable manufacturers, Dual and Systemdek, were showing new budget models, indicating confidence in the market. Dual announced the £140 *CS503-2* – a considerably more substantial machine than its predecessor, whilst Peter Dunlop was spinning discs on the Systemdek *I* (£169 inc. arm) which at first sight looks much like a veneered Rega but incorporates an ingenious Sorbothane-decoupled motor.

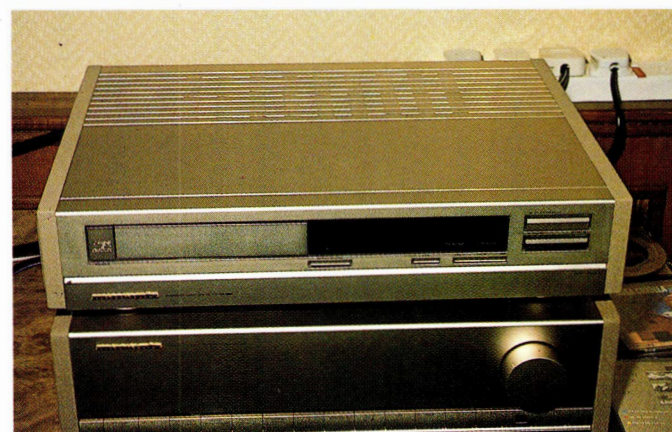
Another contender in the increasingly popular budget market is the Alphason *Nova*, retailing at about £170 without arm. This unusual looking and nicely finished suspended subchassis design uses a thin acrylic platter. The only other turntable news is that Michell has finally developed an inverted bearing of adequate quality and is fitting it to all new *Gyrodecs*

Continued on page 11

Hi-ho silver! Yamaha rings some changes. And below, Marantz's CD95 high-end CD transport.



Remote control loudspeakers from Goodmans.



Sometimes in life, to get the best requires a little extra effort.

We admit that replacing the grille on one of our Series 3 loudspeakers can have its tense moments.

"Ping", it flies out of your hands and settles on the lampshade.
 "Twang", it shoots across the room, catching the cat squarely between the eyes.
 But perseverance brings its own reward because that grille, on or off, is simply the final touch to a host of innovations embodied within the Series 3 range.

THE BAFFLE, FOR INSTANCE
 Traditionally, the loudspeaker baffle is made of wood with all its inherent problems of dimensional instability and construction limitations.

Our baffle is plastic moulded in polypropylene making it highly inert with considerable self-damping properties.

Which means we can add strengthening ribs and vary section thicknesses at strategic points, giving us a baffle which is both lighter and more rigid.

We can incorporate performance-enhancing geometrics not practicable with conventional woodworking techniques, we can design components for function, rather than manufacturing ease and then fit everything together with the sort

Winner



What Hi-Fi? had this to say of the MS3.10 "...a build integrity and finish never seen in a speaker at this price."

WHAT HI-FI? AWARDS



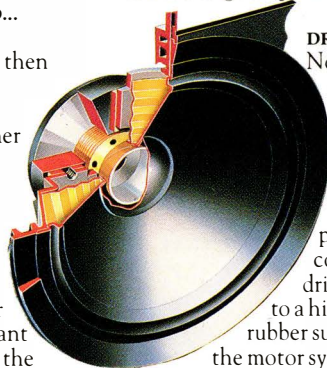
of tolerances that make accurate assembly a reality every time.

NOT ONE, BUT TWO...
 Having devised the polypropylene baffle, we then went one better.

Two baffles. One behind the other. One structural, one cosmetic, made of two different – yet each eminently appropriate – materials with a small air gap sandwiched between upper and lower baffles providing a resonant behaviour far superior to the conventional one-piece baffle.

The upper baffle has it cushy, its sole purpose being to look good, secure in the knowledge that the mechanical performance

of the composite baffle is not being compromised.



DRIVERS...

No compromise either with our bass/mid unit. Each Series 3 speaker features a polypropylene-coned bass driver matched to a high-hysteresis rubber surround with the motor system vented so as to minimise asymmetric pressure distortion. As you move up the range, so does the specification.

Which is true also of the aluminium dome tweeter. Its special suspension, braided voice-coil connections and ferrofluid

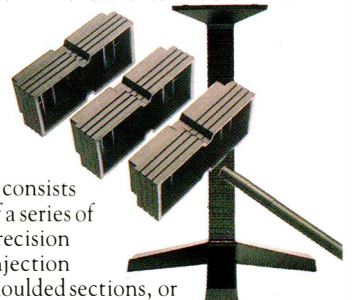
POSITEC PROTECTION

It's not new, but the POSITEC protection circuitry on all Series 3 speakers safeguards, inaudibly, against drive equipment overload or malfunction.

cooling, whilst common to all speakers, are extremely uncommon in terms of performance and reliability with piston operation to beyond audibility enhancing the top end of the range.

IT'S A PEACH

The stand we've designed for the Series 3 speakers is possibly the most innovative feature of all.



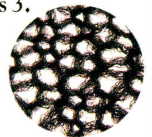
It consists of a series of precision injection moulded sections, or 'vertebrae', which slot together to give a readily adjustable height, providing a structure of which the rigidity and freedom from unwanted resonances is unparalleled by more conventional methods.

WHERE WE STARTED...

All of which brings us back to the grille.

Which has had as much care and invention accorded it as any feature of the Series 3.

It is a fine open weave mesh with no frame to cause diffraction, so it can be left in place (it arrives in position on your speaker) with no fear of reduced performance.



Or you can remove it. It comes off easily.

And then, when you're ready, you can put it back on.

The Series 3 grille is designed rather like a hair net with elastic edges which fit snugly into a groove around the loudspeaker cabinet.

It's as simple – or as difficult – as that.

Sometimes in life, to get the best requires a little extra effort.

Mordaunt-Short

CLOSER TO PERFECTION

plus, for a small fee, any old ones as well.

Not surprisingly there was plenty of new digital product, including the Marantz *CD95* (£1,300) which is effectively the transport section of the *CD12*, Marantz' top of the range player. Yamaha had a couple of tasty machines, the *CDX-530E* and *730E* – 18-bit players priced at £180 and £230 that stood out with their brushed silver fascias. Yamaha also had some of the new, very stylish *Astarte* models. The *YST-9* (£250) is a very petite grey receiver which comes complete with small (about 8in x 5in) and very slim speakers that can be hung on the wall and incorporate 'guaranteed-to-break-the-ice-at-parties' *Astarte* bass. Combining the *YST-9* with Yamaha's £200 personal CD player makes just about the neatest audio system we've encountered.

The only other source component that caught our eye was Audiolab's tuner. Because of product availability the Audiolab folk were not particularly keen on us taking a picture of it – they needn't have worried, given the rather dim nature of the photographic results. Suffice to say that the *8000T* will cost around £400 and is comprehensively equipped in the usual Audiolab style. Which just

about wraps up front end activity, apart from two components in a stylish new Kenwood system, one being a CD player and another a proposed tuner – see our separate *Update* story for more on that range.

New amplifiers seemed to be mostly of the expensive variety with Pioneer bringing along its rather wonderful *M6* monobloks – 300W, Class A, no negative feedback – the canine's gonads – and a snip at £8,000 or thereabouts. In the HW International room there was far too much new Carver equipment to cope with, so the most interesting looking one got the attention. This was a *Silver Seven T* monoblok, a somewhat less expensive transistor version of the company's tubed *Silver Seven* (£17,000!). The *T* offers 550 watts for £950, a comparative bargain. We'll try to catch up on the various new receivers and even an integrated amplifier (£555) in our spring report from Bristol. In the same room were two new Hafler products, a preamp and a tuner with the name *Iris*, and styling along Arcam lines but with prices to save up for. The pre retails at £645 and the tuner £720.

New British amps included the finalised Naim *NAC 52*, a sophisticated and expensive beast with full remote control.



Sounding anything but wooden: Alphason's stack at Audio 90.



Aspiring to the real thing: Soundwaves in-car.

IN BRIEF

Sound Principles is a new hi-fi salon in Northamptonshire. Stocking Roksan, Quad, Aura and other respected brands. The shop can be found in Queen St, Wellingborough. (0933) 441907.

Soundwaves, an in-car specialist based in Reading, is now demonstrating its state of the art Nakamichi and Alpine system in a five litre BMW. Test drives/auditions: (0635) 521577.

Dixons Group has sold the computer installation and maintenance business run by its subsidiary Mastercare. National Technical Services Ltd bought the business for a reported £460,000, and has taken on 53 Mastercare employees. The outcome of the Monopolies and Mergers Commission enquiry into the bid for Dixons by Kingfisher plc (owner of Comet and recent buyer of Laskys) is expected on April 27th.

Belfast's Zeus Audio is holding a musical and 'surround sound' evening featuring Yamaha equipment on April 11th starting at 7.30pm. There is also time – if you bought an early copy of *Choice* – to get to the Audio by Design evening on March 21st. Both events will be held at the Drumkeen Hotel in Belfast and tickets are from Zeus (0232) 332522.

Aston Audio is holding a Cambridge Audio musical evening on Wednesday April 11th at 8.30pm in the Stanneylands Hotel, Wilmslow, Cheshire. The 90-minute demonstration will mainly feature the new Cambridge *CD3* CD player. Tickets: (0625) 582704.

Even at over £3,500 its first year's production has already been sold – talk about carving out a niche! In a more down to earth vein Kelvin brought along its new-look *Integrated* amplifier, a plainer blue/grey enamel finish replaces the handles and hard edges of the original. Price is now £395. A new name at the show was T & R Industries, a small Coventry based amplifier manufacturer showing a solid looking pre/power combo called *APP 6/MPP 9* (£1,799/£1,099) that warrants investigation. The price list also mentions a 'CD D/A converter refined unit upgrade' at a hefty £1,699 – sounds interesting.

On the loudspeaker front there were new contenders for just about every market. At the less 'phile end of the scale were a very dinky pair of Nagaokas in moulded plastic and mesh whilst at the opposite end of the physical spectrum the show saw the re-appearance of Cerwin Vega. This is an American company that produces some very large speakers with a particular appeal to bass freaks, so anyone who wants that PA sound in the home should look them up. On the high fidelity front Proac was playing its *Response Three*, a substantial but attractive design with diagonally aligned drivers for £3,000.

Another contender out for an airing was Monitor Audio's *Studio 10*, which takes the MA metal cone approach a step further by incorporating a ceramic coated alloy mid/bass unit. Price seems high for the box size at around £1,000 but it's touted as being 'the business' by Mo Iqbal, MA's MD. Which just about wraps up the loudspeakers, so I'll leave them to Dan and make do with mentioning the Ikea curtains in the Harman room – very nice Keith!

The summer sounds of village cricket. Auntie Beeb's measured tones. Both indisputably British. But Sony?

In actual fact, Sony's ES separates range sounds equally Anglo-Saxon. If only because it's produced with the help of the world's best audio specialists.

Us. That is, a team of distinctly British consultants, attuned to the precise demands of the British ear. (And, seemingly, to the preferences of the British hi-fi media.)

What of the pedigree of the equipment itself?

The range of CD players brings 45 bit eight times over-

sampling digital filtering to Britain for the first time. As the designer would have it, this transcends engineering. What's left is pure musicality.

In each model, interference has been all but eradicated. The CDPX7, for instance, sports ten times over-powered transformers, reducing magnetic leakage, fluctuations and hum to the unmeasurable.

(In fact, the obsession with obliterating spurious noise is carried over to every ES component. Thus all tape heads are laser welded, avoiding magnetization during manufacture.)

LEATHER ON WILLOW. THE BBC. SONY.



SONY ES

Among the amps, you'll discover another catchily named first: Pulse Density Modulation Digital Analogue Conversion. It's enough for some critics to swear by, but the choice, should you prefer 'conventional' DAC allied to a CD player, is yours.

Whichever, all ES amplifiers have a 'source direct' facility. Bypassing tone controls and filters, the net result is a 'piece of wire with gain' for the purists.

The range of speakers for the ES system is as impressive as it's broad. A listen to the twin drivers of

the APM 141s, for example, is an education in ice-like dynamic control.

And every one of the ES tuners features Sony's unique Direct Comparator circuit, specifically designed to combat FM station 'drift' and ensure crystal-clear reception.

All said, the entire ES range sets punishing standards for hi-fi separates.

After visiting a dealer listed overleaf, perhaps you'll ask the same question Sony engineers ask each day.

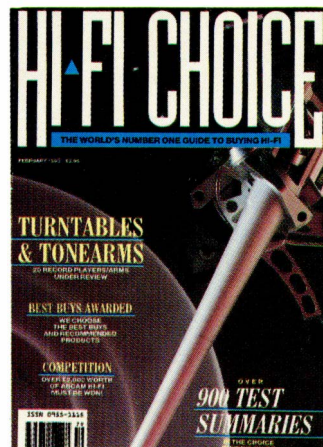
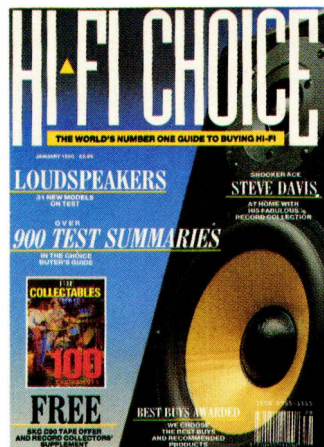
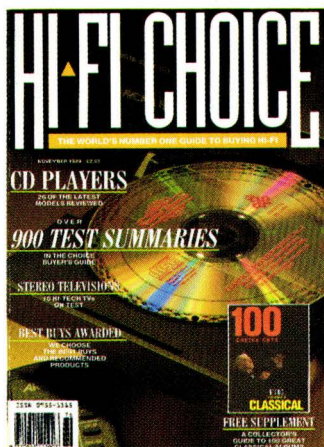
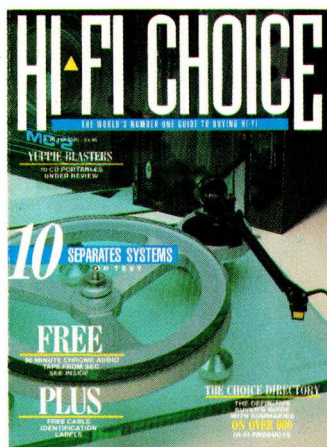
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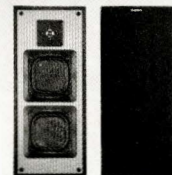
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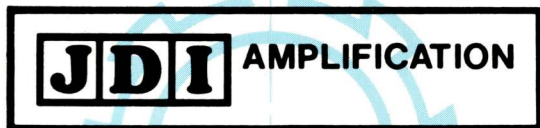
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CHOICE SESSIONS

Things we hear . . . This month, a new preamplifier called Finestra raises eyebrows; Snell's smallest Type K loudspeaker temporarily replaces the larger Type JII in Jason's system; the Meridian 206 sounds even better than last year's 207 Pro.



16-BIT SOUNDS

John Seabury finds few faults with the new Meridian 206 16-bit CD player.

Opening boxes is one of the best things about being a hi-fi writer, especially when the product in question is as interesting as Meridian's 206 CD player. The 206 is a new 16-bit, four-times oversampling machine costing £800, and representing the lower tier in Meridian's revised CD line-up, with the upper tier to be occupied by its 208 PDM model. The 206 is a simplified version of the older 207 Pro model, designed as a stand alone player for consumers who don't need full system integration with other Meridian components. So gone are the 207's preamp facilities, including line, LP and tape inputs, electronic volume control and headphone socket – though the 206 can still 'talk to' other 200-series components via its network socket.

The 206 may be a simplified version of the 207, but the sound quality it promotes is truly excellent, pipping the 207 at the post time after time, with extra detail and a more accurate sound squeezed from each disc that was tried. In fact the 206 offers a seductive combination of controlled but generous power, fine resolution of musical strands, and the articulation to hold a performance together. I found myself digging out all sorts of discs!

The 206's build-quality is noteworthy, too, in an age of moulded plastic mechanisms and mass-produced audio circuitry. The new machine is a two box player, like the more costly 207 but here the boxes are permanently linked. The cases themselves are of black, epoxy-enamelled aluminium, and the disc drawer is solidly built with a soft Nextel-

type coating on the upper surface. The drawer action is smooth and the glass front fits snugly to isolate the disc from air-borne vibration. There's also a proper suspension, to protect the laser from vibration during play. Outputs are provided for both wired and optical fibre digital transmission, along with a pair of 'conventional' analogue phono sockets.

The 206's facilities, while slimmed down, are far from spartan. You can program 25 tracks in any order, or use 'cancel' to exclude a track. There are the usual display options, and the machine will display index points. There's also an intriguing 'continue' function. After 'stop' or 'standby', you can restart the disc at precisely the point you left off, by pressing 'continue'. With the 206 comes a slim plastic handset, allowing you to carry out most operations remotely. However, if you're hell-bent on accessing index points or on full 'cancel programming', you'd need the big 209-system handset.

In use, the 206 is straightforward. Meridian intends you should leave it connected to the mains all the time, since in 'standby' mode the low-level circuitry is kept warm, ready for action.

I've suggested I was pleasantly surprised by the sound quality – it's clear the 206 produces top-class sound on a wide variety of musical material. I also enjoyed the improvement over the 207: not earth-shattering, but the sort of all-round improvement which matters to a serious listener. In fact, these differences illustrate much of what is meant by 'better sound' and I think it's worth spelling them out.

The first thing which struck me was the 206's nimble-footedness in tracking fast

instrumental passages. The machine also offered fine vocal detail: when male and female vocalists sang in close harmony, as on Eurythmics' *We Too Are One*, the 206 made it clear who was singing what and when. I'm sure Dave Stewart will be pleased to know he's not just an Annie Lennox overdub!

The tonal accuracy of the 206 allowed closely-related instruments like clarinet and oboe to be distinguished more easily; music which depended on the interplay of different strands benefited considerably. And while some hi-fi components turn music into a spotlight foreground and vague background texture, the 206 retained detail and dynamics in the background parts. This made Strauss' *Tales From Vienna Woods* seem less a lightweight filler and more a carefully-crafted miniature.

With appropriate speakers the 206 can set up a wide and deep soundstage, and on discs like Chris Rea's *The Road To Hell* it gave the sort of full-bodied sound which makes you want to turn the volume up (and up . . .!) The bass on *Daytona* was gorgeous – rounded and deep but tactile too. And you could tell just how long each note lasted. The upper-bass and lower-mid were quite free of that 'bloom' which obscures detail. I did sometimes wonder if the 206 lost a little to the 207 in terms of 'bass drive', but it's simply that the leaner, tauter sound of the 206 seems less 'generous' against the slightly looser and cloudier sound of the 207. I always learned more about the music with the 206.

The 206 scores well if you judge hi-fi performance by 'feel', too. With almost every disc there was a good sense of flow or momentum with none of that 'it-sounds-impressive-but-why-did-they-bother-to-record-it?' sensation.

And the way one section of the music grew out of another brought the whole thing closer to real music. Not that the 206 is overly kind – if you present it with a sheeny, phasey recording, that's just what you'll hear!

So to two criticisms. First the lack of a headphone socket. What could be nicer late at night than plugging a good pair of 'phones into your new £800 CD player and hearing right in to the source?

"The 206 is intended to interface with the user's existing preamplifier", pointed out Steve Hopkins of Meridian Audio. "Because of this there's no volume control either; it's down to the way the 206 has been conceived – and priced." I suppose we'd hardly thank Meridian if it stuck a cheap potentiometer and budget IC in there . . .

The second moan is over pricing. Why, if it's a simplified version of the feature-laden £1,050 207, does the 206 still cost £800? Why not £499?

Steve Hopkins answered: "Most of the cost of the 207 was for the CD player itself, the extra inputs and tape facilities added relatively little to the cost. The electronic volume control was probably the dearest 'extra', but it just isn't realistic to expect the price to be halved." And I can see I've answered my own question – as the sound quality, construction and appearance do make the 206 well worth the money in my opinion.

But why buy a 16-bit CD player now, when PDM and PWM 'bitstream' models are already with us? In the 206's case, the answer is the way it sounds. Meridian has learned how to get the best out of this tried-and-trusted technology.

So if you want a player with preamp facilities, and can afford Meridian's 208 PDM

Meridian 206 (left): the music feels' right. Below: the Finestra preamp is a radical design in more ways than one.

player at £1,479, great, but the 206 is a fine model in its own right. We now know that things like power supplies and mechanical integrity matter just as much as the digital technology used. This is where specialist firms like Meridian score, and is one reason why it's still worth spending £800 on a CD player. For me, the resolution of fine detail, coupled with the 206's sense of drive and 'flow', is what hi-fi is all about.

OPEN WINDOW

A new name on the UK scene, the Finestra preamp has an interesting pedigree. John Bamford has been listening to it.

Nine times out of ten when a new 'specialist' component arrives on the UK hi-fi scene – whether it be a turntable, amplifier or loudspeaker – it's a hand made item 'built to order' in some enterprising engineer's small workshop. However, the background to the *Finestra* preamplifier which some good quality hi-fi shops are just beginning to stock is quite, quite different.

The design of the *Finestra* is one man's vision of how a high quality preamplifier should be constructed, but here any similarity with the majority of new British-built audiophile components ends. Designer Tom Evans works in the heart of the UK's 'silicone valley' in Berkshire, where he is employed by a large hi-tech electronics company. The service this company provides includes computer aided design and manufacturing (CAD/CAM) of all kinds of electronics components – some of it highly secretive work for the Ministry of Defence. Tom is a hi-fi enthusiast, and has some unique ideas in amplifier design. A couple of years ago he persuaded his employer's board of directors to invest some time and money in a new venture: manufacturing hi-fi amplifiers. Consequently EC Audio was formed as a subsidiary company and the first fruits are what we see here, the £1,299 *Finestra*. £1,150 buys a line-only

version for households with no record player; if buying a full-blown *Finestra* with on-board phono stage, ideally you should specify MM or MC sensitivity/EQ. Switchable MM/MC costs no extra and is readily available if that's what you must have, but Tom says the sound will not be *quite* as good as a preamp optimised for one or the other.

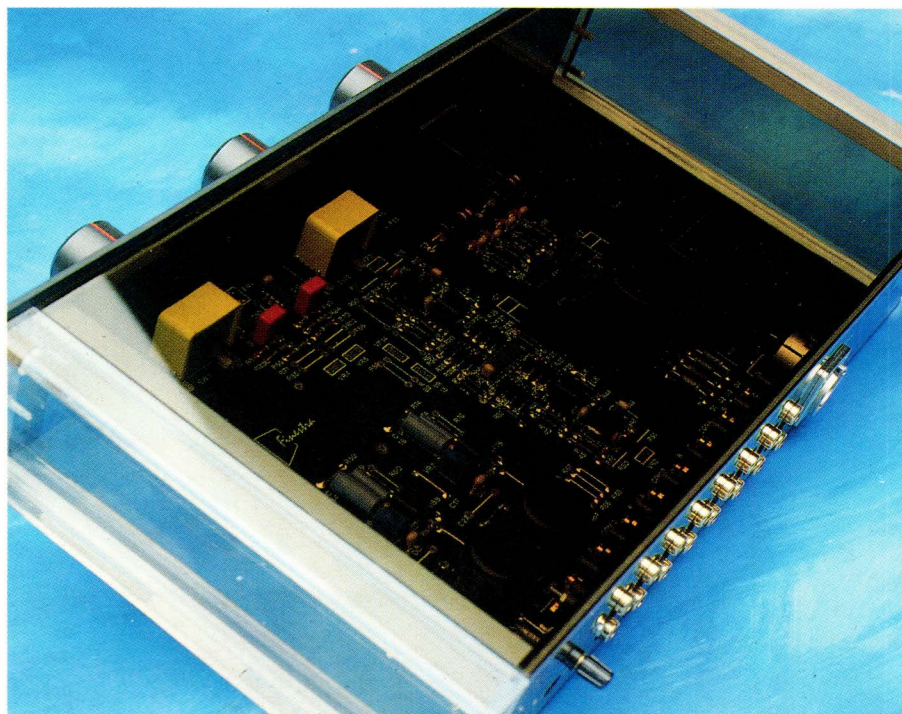
As you can see from our photographs, the *Finestra* is stylishly housed in acrylic – which is not just for show (though it does look nice) but helps sound quality too. Just ask DNM! Inside the clear case lies a (very) hi-tech six-layer board with star earthing, fully shielded from RF. (Using a multi layered board helps reduce RF problems, says the designer.) What goes against the grain, however, is the *Finestra*'s use of integrated circuits (ICs) when many audiophile preamp manufacturers make a big noise about the fact that they use only discrete transistor circuits – or valves, of course, but the valve versus solid state debate is a separate issue.

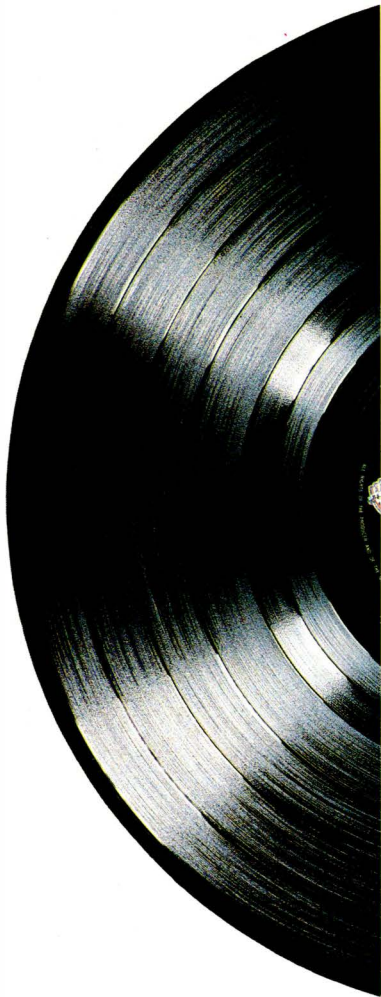
So how can the *Finestra* be a serious bit of kit when it uses ICs? What the designer says is this: "You should really regard the *Finestra* preamplifier as a composite amplifier. It uses op-amps the way most designs use transistors."

The company isn't giving much away about its theories, having spent a small fortune developing the ideas and patenting designs. I'm told that components have been selected for sound quality not steady state measurement characteristics, *Finestra* runs from "an overkill power supply", and that absolute phase integrity was high on the list of priorities when engineering the device. "Essentially our design philosophy is simple: small signals can be corrupted, and errors will be magnified later in the amplifier chain. And phase integrity is vital – including absolute phase."

The *Finestra* is certainly not what we've come to expect a high-end preamp should look like in 1990, but since first prototypes began to be auditioned by selected dealers in the UK it has caused quite a stir. I've been fortunate enough to hear a *Finestra* in a variety of systems during the past few weeks and it's clearly going to win many friends. For my money it has got none of the transistor glare and 'congested' sound so commonly found in amplifiers which use ICs. Bandwidth can sound unimpressive on some systems, but this is a subjective effect which sometimes says more about the system than the transparency of the *Finestra* itself. It needs careful auditioning, because when suitably partnered it can give some very expensive audiophile components a run for their money. I've heard the *Finestra* fail to impress, and I've heard it sound quite superb. When it's superb you will hear valve-like sweetness and soundstaging coupled with extremely sharp focus and fast leading edges. It's a thoroughbred built to price, and while over £1,000 is a lot to pay for a preamp – any preamp – the *Finestra* is in fact competitively priced for the performance on offer.

And that's not to mention pride of ownership, which will doubtless further increase when EC Audio produces a similarly radical power amplifier to partner it. We'll be keeping you posted.





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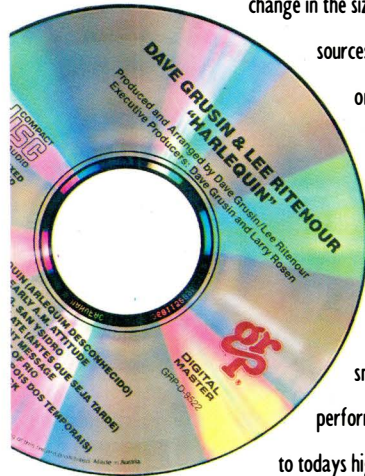
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SMALL IS BEAUTIFUL

Jason Kennedy makes good sounds in cramped surroundings with the understated but capable Snell Type K.

For £489 the Snell *Type K* doesn't look much of a bargain. It's physically similar to a Wharfedale 505.2 but even less exciting, the wood veneer and plain black front and back baffles giving it an understated, conservative appearance. But, like a book, a hi-fi component shouldn't be judged by its cover, but by its ability to reproduce recorded music. In this respect, all of the Snell loudspeakers we've encountered, including this the smallest one, are well qualified.

But why does such a modest looking speaker retail for such a serious sum? For a start, it comes from across the pond which is never a good start in the cost stakes, but more important the crossover on each Snell speaker is tailored using alternative crossover components to achieve a specific reference response. In practice this means that if you open up two samples of an otherwise identical model you will be unlikely to find identical crossovers.

The rest of the speaker is more straightforward, an eight inch paper coned mid/bass driver and a fairly ordinary looking tweeter sit beneath a stoutly supported grille cloth, whilst on the rear is a set of four three-way binding posts. Although this latter adaptation for bi-wiring/bi-amping is quite commonplace nowadays it's something that Snell has been incorporating for a lot longer than most. It is, of course, well worth taking advantage of with two lengths of speaker cable per speaker.

So what do they sound like and how come yours truly has been prepared to give up his larger *Type JII*s for the time it takes to run in and properly assess another loudspeaker? As the second half of the question is more straightforward to answer here goes. Basically, although Snell *JII*s are relatively uncritical of siting and room size, recent circumstances have meant that only a fairly small, crowded room has been available for listening purposes, and this was having rather unhealthy effects upon the bass performance of the *J*s. In these surrounding sealed boxes with relatively limited LF extension, such as the *K*s, are far more practical. Having tried both speakers in that room I wouldn't hesitate to use the smaller ones, the trade off of extension for control being musically preferable.



Snell's smallest Type K loudspeaker: don't be misled by the plain appearance.

But what do they sound like? To be frank it's hard to say, as they are distinctly lacking in character and fundamentally very transparent to what's being fed into them. If pressed, one would have to say that they sound 'open', inasmuch as they make most other loudspeakers sound closed in and dull. What's more they manage to do this without being bright or obvious, unless of course the amplifier or source being used has this characteristic. In most respects all Snell speakers sound the same except that the bigger they are the lower they go. They all seem to have an effortlessness and fluidity that is extremely beguiling and very hard to do without once lived with. This is due in no small part to the fact that one rarely hears them partnered with anything but tube electronics (their high efficiency making them eminently suitable for low power amplifiers), which have the same sort of characteristics, but whatever you feed them with they sound consistently more open and natural than the competition.

One cannot escape the fact that the *K*s are remarkably appealing loudspeakers, the tight bottom end and clean extended treble really making the most of a good system in virtually any environment. The distributor

Audio by Design always takes the *Type K*s along to hi-fi shows because it knows they will work in even the flimsiest or pokiest hotel room. OK, you could say the same of many small loudspeakers, but very few of them offer the transparency and lack of coloration of the *K*.

Of course it's not all things to all men. Its major attribute (transparency) also can be its shortcoming if partnered with inherently aggressive electronics. Because of the relatively relaxed HF response of many British loudspeakers there has been a tendency for companies to produce fairly bright amplifiers in an attempt to instil 'life' into reproduced music. Thankfully these are in the minority and the majority of 'hi-fi' components are reasonably neutral or can be made to sound that way with careful cable selection – or the application of selective equalisation as it might otherwise be called.

At the end of the day, if you have a record player and a Class A or 'soft clipping' amp of almost any price the Snell *Type K* will be a revelation. If you are in the larger Class A/B, B amplifier camp and use CD the *K* will reveal a sense of life that other speakers only hint at. However, for the same price you can buy better bass extension, speakers that will survive higher levels, and sometimes speakers that have a certain musical magic if not a particularly accurate response. You pay your money and makes your choice – in a smaller than average room I'd choose the *Type K*.

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ASPIRATIONS

Installing a multi-room sound system while her new home was being refurbished was the logical approach, this month's hostess told Dan Houston. Photographs by Christopher Richardson.

A Musical Country House



"I was ripping out heating systems and staircases and building an extension so I thought I might as well do something nice," smiled Tamara, who hails from Kentucky, married an Englishman and arrived at her Wiltshire home three years ago.

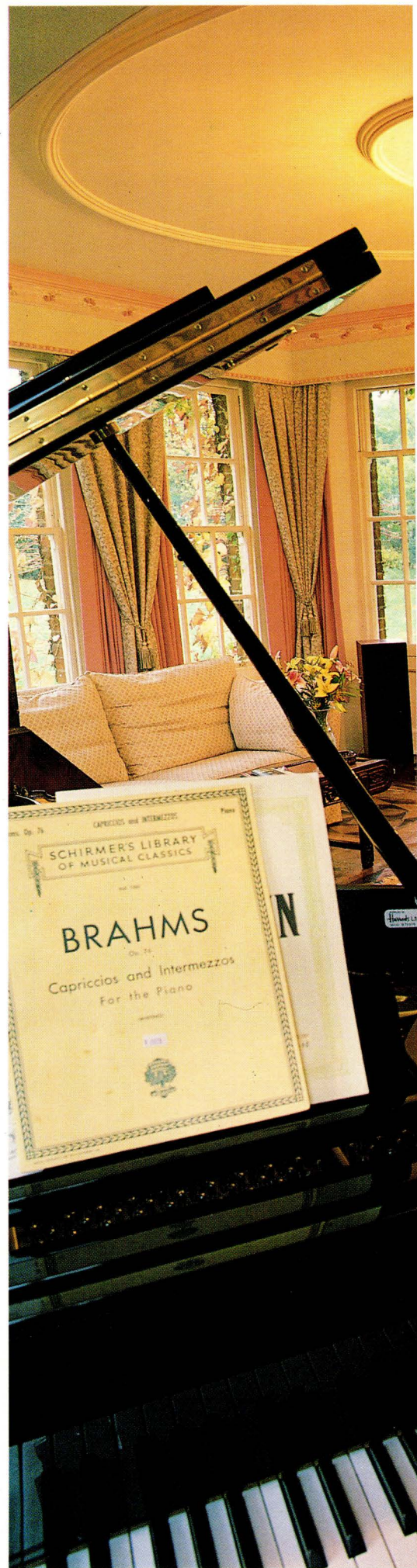
Now finished, the house retains most of its historic charm while boasting an array of modern features such as the sound-system linked through six rooms and the swimming pool. Indeed a sweeping new staircase, of American black walnut, looks more mature than some of the original features. The hi-fi and its infra red sensors don't seem intrusive in their setting – small loudspeakers or flush-fitting ceiling types are both aesthetically and sonically acceptable. As Tamara puts it: "The house has become hi-tech although we're not really a hi-tech house."

On the wet day of our visit the views from the 'new' side of the house are of drip-

ping oaks and a patchwork of damp horse paddocks. One area of lawn is marked by a circle of powerful lights where our hosts can land by helicopter at night. Tamara is learning to fly, although more traditional forms of transport are also available in the stables.

Before choosing the sound system our hostess decided that she wanted music 'everywhere' in the house with one room containing the source components. By having the equipment installed while builders were at work, all the wiring and connections could be hidden behind plaster or – as in the case of some of the loudspeakers – set into the ceilings. "I hadn't heard anything previously but I wanted through sound. I like music and we entertain quite a lot so it's useful to have the music playing through several rooms," she says.

She went to Alan Holmes, of John Holmes Music in Swindon, who set up a demonstration in the swimming pool – the





Queen Victoria may have danced on the floor here but not to the sound of Wharfedales (left). This is the slimmer's ideal cookie jar (above).

nerve centre of any party – and promptly got the contract for the rest of the ground floor. Using Revox based equipment he has provided sound to the drawing room, music room, dining-room, long room, study, kitchen and of course the pool.

In each area the functions of the main system – set up in the drawing-room – can be comprehensively controlled using Revox' (B208) remote handset which winks its commands in infra-red to one of the system's eight 'eyes'. These have been installed so that wherever you are you can tell the Revox what to do. Sensors have been installed in the kitchen, dining-room, music room and study with two each in the long room and swimming pool. There is also a sensor on the system itself. The list of commands includes changing the source from record deck to tape, CD or tuner (assuming you have loaded software into the equipment), altering the balance, bass and treble of the loudspeakers and altering the volume in each room. The last feature is quite expensive – each room needs its own dedicated power amplifier – but it is also the most socially graceful. (Not always a good idea to start milking the system for all it's worth while your nearest and dearest makes an important telephone call from the next room on the same signal circuit).

It's all made possible with the Revox B250 integrated amplifier, a £1,200 box of

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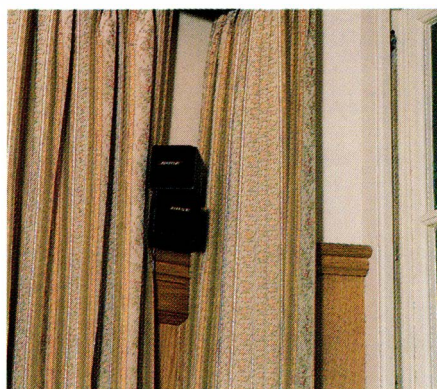
THE SECOND AUDIO AMPLIFIER



tricks designed especially for this kind of system. The amplifier sits in the main equipment rack in the drawing-room where all the source equipment and Tamara's CD, tape and record collections are housed. The line-up consists of cassette deck, tuner, CD player and direct drive turntable all of which match the amplifier in the Apollo isolation support rack. The Swiss-made Revox system is impressive in terms of looks and feel. Its solid, clean lines reflect high standards of engineering and breathe reliability. But even so it gets overshadowed by the 37-inch Mitsubishi VS66EK television.

The TV is kept on for Percy, the African Grey parrot who apparently does a terrific rendition of the back door creaking, but who can also then call the dog to see who has come in. So far, he is the only flying audiophile we've come across. The television is wired through the system to the floorstanding Wharfedale 512 loudspeakers which are supplemented by a diminutive but punchy little pair of Bose AM5 two-way speakers mounted high up on the wall at the back of the room. A bass-bin, or subwoofer, provides the lower frequencies for the Bose speakers, and (because bass is omni-directional) is tucked away out of sight below shelving at the back of the room. The four-speaker arrangement only gives extra sound in the room and is not used as part of a surround-sound system (which would be quite something with the Mitsubishi-Wharfedale combination). Stereo imaging is therefore compromised somewhat.

One of the many attractive features of the Revox amplifier is that it can drive the



A clutch of Bose speakers serenades swimmers while the tiny Acoustimass fills rooms where you'd think it might get lost.

drawing-room loudspeakers and another pair in the nearby kitchen with one source while the rest of the house enjoys something else. Handel's *Water Music* can inspire people in the pool while Percy gets *Peer Gynt*. The 'loudspeakers' in the kitchen obviously have been designed with country farmhouse kitchens in mind since all country farmhouse kitchens have cookie jars (even if music has usurped the place of the biscuit). The working part is a full range driver set in the top of the jar pointing upwards, but the visual design is everything, and as such might even get grudging approval from audiophiles.

The rest of the house is powered by a rack of amplifiers – five Revox B242s – and their corresponding Revox 209 control units, all kept fan cooled in the attic. It's quite an impressive pack and Tamara commented: "The first time my husband saw

them he said what *are* those?" From the power amps around 1,000 feet of Monster *Original* loudspeaker cable runs to the various loudspeaker terminals.

A second pair of Wharfedale 512s are used in the music room. This is on the 'new' side of the house and has been extended with the octagonal bay window large enough to accommodate the grand piano on a slightly raised dais. It is bright and airy with windows on all sides taking advantage of the light. The original long windows were framed by autumn-red ivy at the time of our visit. The wooden flooring for the room, patterned with light and dark parquet blocks, originally came from Balmoral Castle where Queen Victoria had disliked it. "It was quite difficult to get the pattern right when we relaid the floor after the work was done," Tamara told us.

To get to the study from the music room one crosses the ash-panelled hall or 'long' room with its French windows overlooking the lawn. This is the central area of the house and has been opened up creating easy access from the front door or the French windows to all the downstairs reception rooms. At either end of the long room a pair of Bose 101 loudspeakers are ceiling mounted and all but disappear against the background while providing quite an obvious presence sonically.

The oak panelled study carries even less evidence of hi-fi to detract from its quiet and calm atmosphere. Here Alan Holmes opted for a second Bose *Acoustimass* AM5 system with the bass unit hidden away in a corner cupboard while the satellites on the walls provide mid and high frequencies from above head height. These Boses look



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The system (right) stacks up in the drawing-room from where it is relayed to the rest of the house. Hiding the Acoustimass bass unit (below).



so small, they are almost hidden between curtains, and it seems impossible that they could deliver anything approaching decent sound quality. When *Choice* reviewed them last year they were felt to be a little expensive, but they are surprisingly capable and Bose is constantly developing the range (making them even smaller).

Nearly all the loudspeakers in this setting are made by specialist manufacturers Bose and Wharfedale. Revox does make loudspeakers but its models don't have a very high profile in UK domestic hi-fi. One pair of Revox *Piccolos* have been used. These are wall mounted (not flush) in the dining-room to provide background music or something like the news if you wanted to listen during a meal.

Tamara's most significant praise was for the installation in the swimming pool. The pool is adjacent to the back of the house with access through a corridor. The building is purpose built with a central wooden pillar supporting a gently sloping roof – part of which is glazed. Large plate glass

doors open for comfort in the summer months. Around the top of the pillar are four loudspeakers giving 360-degree sound coverage. Tables and chairs with an adjoining shower room make for a self contained area: "We spend a lot of time here at weekends; it's nice to come in here and eat and swim. It made a lot of difference when the sound system was put in," Tamara enthused.

The swimming pool area has to be kept very warm as the pool itself is practically tepid. The humidity is therefore stifling and Alan Holmes explained that the Bose *402s* were a PA specification to be able to cope with the adverse conditions. Again none of the cabling is visible – being taken through pine box sections down the side of the beams. The humidity and the shape of the room contribute to some superb acous-

tics and Bose's pedigree in the disco and professional arenas makes the loudspeakers ideal for parties.

This installation caters both for extended listening periods in the music room or the drawing-room and as a background for parties or everyday life through the house. You could spend the same amount of money on a simpler system which would retrieve a higher, or truer, quality of music from your record collection but that was not the intention here. Tamara described the sound quality as wonderful and has found (after a few visits from Holmes) that it is easy to operate.

At the moment the technology for such systems is relatively new, but it is likely that in the era of the electronically-intelligent home, such systems will be as common as lighting or plumbing, and taken for granted. As far as the quantity and quality equation goes, more doesn't always mean less, especially when you buy high quality Swiss engineering.

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Wharfedale <i>512</i> loudspeaker	n/a
Bose <i>Acoustimass AM5</i>	£529
Bose <i>101</i> ceiling loudspeaker	£159
Bose <i>402</i> loudspeaker	£599
Demion <i>Pot</i> speaker	£99
Revox <i>B242</i> power amplifier	£1,592
Revox <i>B209</i> controller	£388
Loudspeaker cable Monster <i>Original</i>	£4/m
Total cost including labour	£27,500

System supplied and installed by: John Holmes Music Ltd, 21-23 Faringdon Road, Swindon, Wiltshire SN1 5AR. Tel: (0793) 534095.



FOCUS ON . . .

Philips' 1-bit PDM digital-to-analogue conversion system, first heard in the Sony TA-F630 'digital amplifier', can now be heard in four more components: the Rotel RCD-865, Philips CD840 and Meridian 208 compact disc players, plus the Deltec PDM One standalone D-to-A converter. Paul Miller has been listening to (and measuring) all four – and he's impressed with them all.

. . . the sound of PDM



Philips' 1-bit PDM digital-to-analogue converter (DAC) chip set wasn't really intended for serious hi-fi applications, so the story goes. Rumour has it that the 1-bit DAC was designed primarily for ease of manufacture. It would be cheaper to make, absolutely consistent from sample to sample, and thereby reduce the cost and improve performance in 'mass market' CD players.

To our knowledge a low power version of the chip for use in portable CD players has yet to be developed, but in the meantime it will be interesting to see how long it takes for the 1-bit 'Pulse Density Modulation' (PDM) DAC to start appearing in midi systems and music-centres. Who knows, maybe it will now take longer than Philips first intended, because the 1-bit DAC has proved to be much, much more significant than just a cheap 'n' cheerful solution to a manufacturing problem. From what we've heard so far, it is an exciting development in digital audio – so exciting that Meridian Audio is now using the system in its latest state-of-the-art £1,500 208 CD player, and Deltec Precision Audio has incorporated it in its brand new £475 PDM One, a standalone D-to-A converter which can be connected to any CD player equipped with a

coaxial digital output socket to upgrade its sound quality.

In addition to the two up-market hi-fi components from British specialist firms Meridian and Deltec, the PDM converter can also be heard in two affordable CD players currently on sale in the UK: the Philips CD840 (£350) and Rotel RCD-865 (£300). What we're focusing on in this feature are the differences and similarities between all four products, both in under-the-bonnet engineering and – of course – sound quality.

BACKGROUND NOTES . . .

Hi-Fi Choice has already explained in some detail the differences in operation between 16-bit and 1-bit converters. It took several pages to explain it then, so for those readers wishing to better understand the changing technology in digital audio the best we can do here is refer you back to Issue No. 77 (December '89). But before discussing each player in turn, a few background notes . . .

Philips' PDM converter uses a single current source that is controlled not by 16-bit wide words (which is what's read from the disc) but by a high speed stream of single or sign bits. This stream is gener-

ated in the PDM DAC by first oversampling the 16-bit words to the tune of 256-times (increasing the sampling rate to 11.2896MHz) and then removing, or truncating, the first 15 bits of each re-sampled word to leave the single most significant bit. In fact the oversampling is actually achieved in three stages: four-times, followed by 32-times and then two-times, to give an effective rate of 256-times.

The integral four-times oversampling filter in the chip set is similar to the discrete SAA7220 FIR filter used by Philips in its 'conventional' 16-bit x 4 CD players, and is responsible for the ripple seen in all the frequency response plots as well as the 2nd-order stop-band products (the 'V' patterns) visible on all the 3D plots.

Philips' SAA7320 PDM DAC offers full stereo conversion from a single chip. However, two of our players actually utilise Philips' more advanced SAA7321 PDM DAC in what is called 'differential mode'. Here two stereo PDM DACs are used, one chip handling data pertaining to +R/+L and the other relevant to -R/-L. The +R/-R and +L/-L PDM outputs are summed in an integrator, which lowers even-order type distortions, improving the S/N ratio and increasing the peak output from 1V to



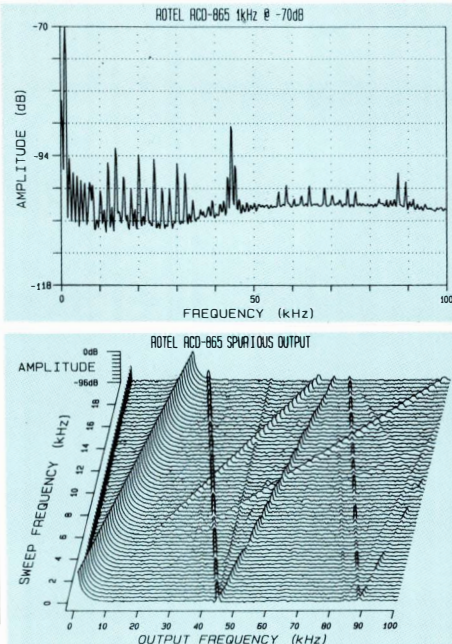
the nominal CD standard of 2V.

The general operating principles of the *SAA7320* and *SAA7321* are identical, the latter is simply a more evolved IC. Specifically, Philips decided to change the filter coefficients in the 32x section of the chip because of overload problems encountered around 6kHz in the *SAA7320*. This also changed the chip's characteristic idle pattern so the dither frequency had also to be changed from 352kHz to 176kHz. Improvements were also made to the 1-bit converter itself as well as the two internal op-amps.

ON TEST

Rotel RCD-865

Launched to complement Rotel's cheaper *RCD-855* CD player, the *RCD-865* may look identical but of course its internal architecture is quite different. The *RCD-865* represents PDM at its most basic, yet also



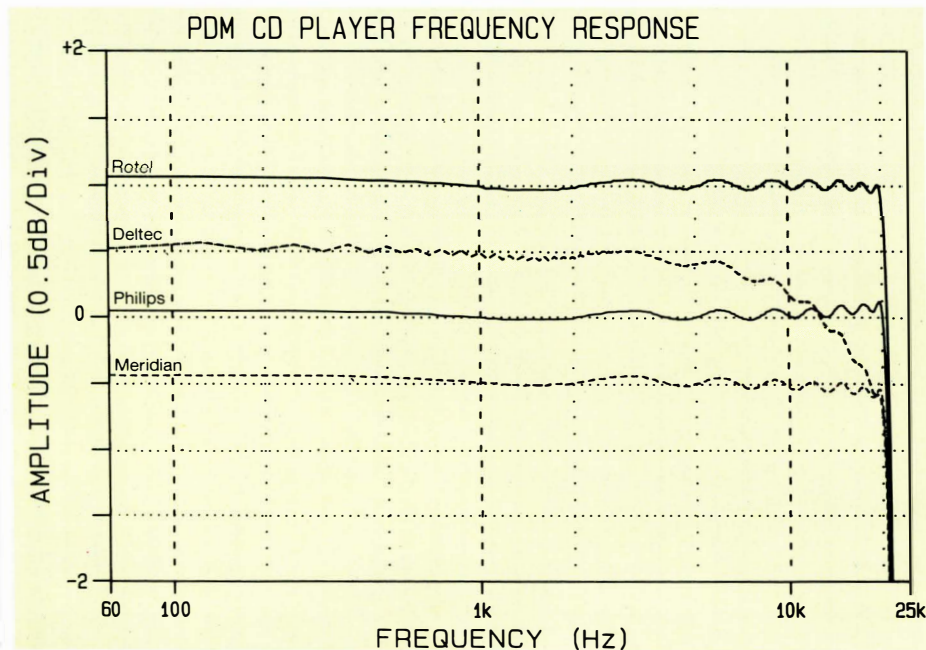
serves as an object lesson in how successful this new technology can be – regardless of implementation.

Construction and feature-wise it parallels the 16-bit *RCD-855*, providing standard track skip, fast music search, intro-scan, shuffle and program play options together with a direct track access keypad on an accompanying IR control. Basic it may be but at least Rotel has eschewed the plastic mouldings used by Philips and opted instead for a rugged matt black alloy fascia. Still the *RCD-865* is considerably less versatile, lacking a digital output and advanced features such as FTS and index location.

The same transport and servo electronics are used in both Rotel players but the latter incorporates various power supply revisions to suit the new PDM DAC. A 2nd-generation *SAA7210* decoder feeds a single *SAA7320* PDM chip operating not in differential but standard 'single-ended' mode. The internal clock is referenced to an external 11.2896MHz crystal, while unlike the costlier players, both internal op-amps are pressed into service. Distortion and noise are very slightly degraded as a result but Rotel has attempted to minimise this by running the chip 2dB or so below peak output.

No external gain stages are used so the final output of the *RCD-865* is relatively low at just 0.8V. This is high enough to drive any pre or integrated amplifier but sufficiently low to obviate A/B comparisons with other players.

Nevertheless, Rotel has 'tweaked' the PDM converter with plenty of audiophile passive components, such as the Rubycon Black-Gate electrolytics used for on-board regulation, filtering and decoupling. In addition, multi-layer ceramic capacitors are used for RF decoupling while extended-foil caps have been employed in the damping, de-emphasis and post-



filtering networks. The recommended 3rd-order output filter is used, together with an LC notch filter designed to attenuate the 352kHz dither tone.

Because Rotel is using the earlier *SAA7320* chip in single-ended mode, both low-level distortion (2.8 per cent at -60dB) and the S/N ratio (93dB) are worse than recorded for the differential-mode players. Still, the low-level linearity of the *RCD-865* was not bad at all, registering a maximum error of just -2.3dB at -90dB on the left channel. The player's response highlights the passband ripple generated by the primary 4x FIR filter but, overall, is the flattest in the test.

The rejection of stop-band noise (the 2nd-order 'images' or V-patterns on the 3D

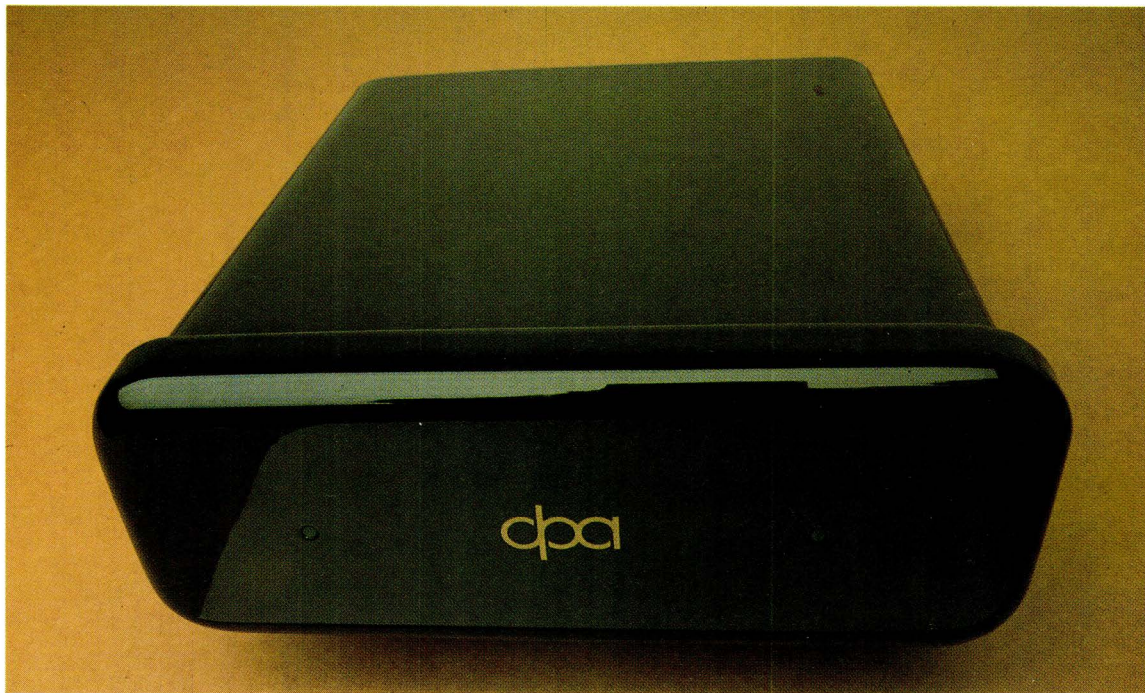
used to regenerate the clock data and rearrange the biphase code of the digital input to a format suitable for the PDM chip. In this case a single *SAA7320* PDM DAC is employed, though the 2nd internal integrator is disabled and the 1st integrator run at a low -10dB for improved performance. Unfortunately the initial decrease in THD from 0dB (0.0085 per cent) to -10dB (0.0027 per cent) indicates that this is not a particularly good example of the chip . . .

Anyway, cascaded passive filter networks follow the DAC prior to feeding two (one per channel) of Deltec's proprietary *DH-OA32* op-amps, functioning here as the 2nd integrator and pushing the output level up to a substantial 2.57V. Once again beware of straightforward A/B demonstra-

tions, particularly as the *PDM One* is also phase-inverting.

Two mains transformers and five individual high performance, low impedance regulated supplies feed separate parts of the circuit; there is even an isolated earthing structure for the digital and analogue sections. Surface-mount components litter the PCB, including special ceramic capacitors used for stringent RF decoupling.

The response of the *PDM One* falls some -0.35dB at 10kHz and -1.2dB at 20kHz yet this appears to have little subjective influence. Perhaps more can be gleaned from the 3D plot which, despite showing a trace of the 2nd harmonic, is markedly 'cleaner' than the others in this test. Simi-

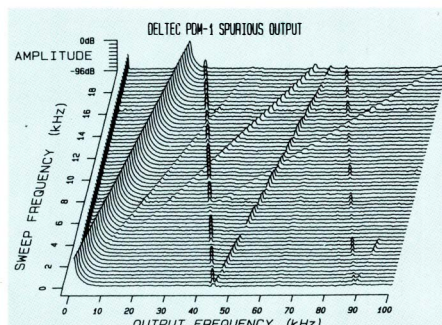
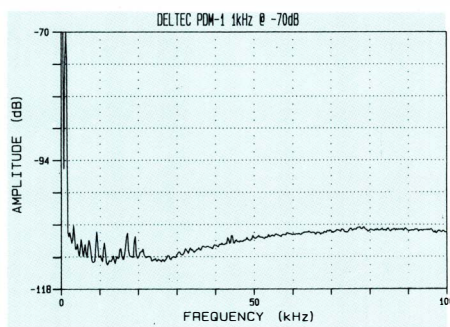


plot) measured 55dB, better than that available from Philips' 16-bit *SAA7320/TDA1541* chipset but equal to that of all the other PDM players. This figure is clearly a direct function of the PDM chip's internal oversampling filter. Unfortunately the 3D plot and the -70dB (1kHz) plot both reveal some leakage of the 44.1kHz sampling frequency at -88dB.

Deltec PDM One

Deltec has already established a reputation for producing very fine amplifiers and cables but the *PDM One* represents its first foray into the realm of digital audio. The *PDM One* is not a complete CD player but simply an add-on PDM D/A converter for linking to the digital output (coaxial only) of any suitably-equipped CD player or dedicated CD transport. Arcam's *Delta 170* is an ideal partner, for instance.

Aesthetically the *PDM One*'s contoured alloy casting matches Deltec's pre and power amps, while much of the internal design is based around a common rationale. A Sony *CX23053* interface chip is



larly, the -70dB 1kHz spectrum details an excellent combination of low audio-band distortion coupled with a very low level of ultrasonic noise.

Referenced to peak level, the S/N ratio of 94dB is typical of a single-ended *SAA7320* while the maximum linearity error of -2.8dB at -90dB is close to that achieved by the Rotel player. Otherwise the figures for dynamic compression, channel balance and the low <2ohm output impedance are all exemplary.

Philips CD840

After much delay and expectation Philips' own PDM-equipped player, the *CD840*, finally went on sale in February. Much of the player is composed of plastic mouldings and follows cheaper units, like the *CD620*, in terms of styling. A host of user-convenient features are offered, including two FTS memories, full track and index selection, a comprehensive track editing mode, random, repeat and program play. So in addition to the vast FTS store, up to 30 tracks can be programmed in the con-

ventional volatile memory.

The intro-scan facility has a variable time option while a full alphanumeric keypad allows 12-character titles to be assigned to each of the memorised tracks. Further to this the display also offers useful prompts either during play or when investigating the contents of the FTS memories. Additional 'personal presets' allow you to determine the brightness of the display together with the play mode, such as auto-play, auto-FTS and auto-stop. The entire range of these functions is also duplicated on a slim but complex remote control.

A variable output headphone socket is included as are defeatable coaxial and optical digital outputs, the latter driven via

of the internal op-amps.

Still, Philips is clearly not running the integrators at peak output as the 0dB level of the player was set at 1.77V, 1.1dB below the nominal 2V standard. The effect of the noise-shaping and breakthrough of residual stop-band products is clearly revealed on the -70dB 1kHz plot.

The 3D plot shows this increase in odd-order distortion with increasing frequency together with the characteristic rippling of the 2nd-order stop-band 'images' centred on 44.1kHz and 88.2kHz. Higher-order sampling images are also visible, working their way from right to left. Once again, 0.1dB passband ripples are clearly revealed in the frequency response, peaking to +0.12dB at 20kHz.

Meridian 208

Despite suggestions that Philips' PDM system would be only suitable for budget or middle-market CD players, one of the players launched was this high-end differential-mode machine from Meridian. Effectively superceding the company's 207 Pro flagship model, the 208 can be used as the basis of a multi-source system, using its internal preamp, digital volume control and optional plug-in phono cards to build up a comprehensive control centre. All this in addition to its duties as a CD player!

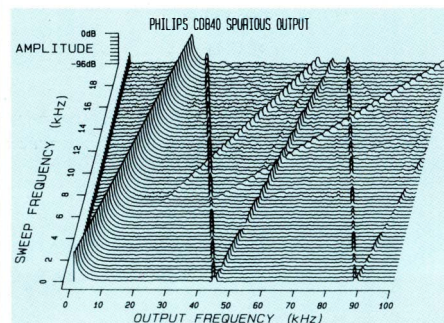
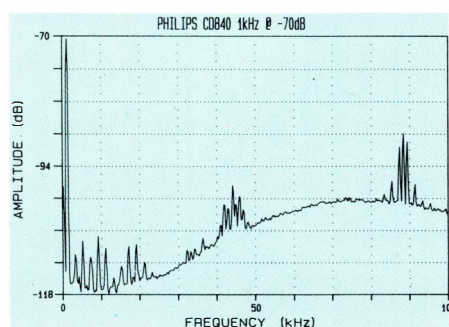
Both in terms of design and aesthetics the 208 has evolved from the 207, though the transport and converter 'boxes' are now locked together. The transport utilises a diecast magnesium top-plate



one of Philips' established SAA7220P/B oversampling chips. This IC simply bypasses the PDM chip and plays no further role in the operation of the player, I hasten to add.

This is the cheapest player to utilise two SAA7321 PDM DACs in differential mode, implemented here in standard guise with one DAC handling +R/+L and the other -R/-L. Commercial grade components are used for decoupling and filtering purposes though. Philips has incorporated a notch filter (centred on 176kHz) within the post-filtering network to further attenuate the dither tone. On test the CD840 proved the least linear of the players even if its symmetrical -3.5dB error at -90dB is still quite acceptable.

This was the only player to maintain the excellent 95dB+ stereo separation available from the SAA7321 right across the audio band, though its S/N ratio was 3-4dB behind that of the Meridian. As expected, distortion was kept to a low 0.0011 per cent from 0dB to -10dB (1kHz) though crept up to 0.037 per cent at 20kHz as a function



mounted on three sorbothane supports together with a steel/polycarbonate arm that swings across to clamp the disc. Third-generation TDA8808/8809 servo control ICs are used, with proprietary adjustments, improving the dynamic control of the rotary motor and track access time (3.5secs for track 99).

A basic range of programming, track skip and repeat functions are available via a series of illuminated buttons on the 208's distinctive fascia, while other features such as fast music search, phase invert and direct track access are accommodated on the comprehensive 209 remote control centre which comes with the player. Within the casework two parallel PCBs, with optimised ground planes, play host to the digital and analogue circuits. The output from the servo board is accessed by a 3rd-generation SAA7310 decoder followed by a standard SAA7220 which, as in the case of the CD840, is used solely to drive the digital outputs.

A separate master clock offers four outputs that keep the two SAA7321 DACs,

EPROM (designed in-house) and decoder in synchrony, the output of the latter feeding a variety of shift registers and gates that re-format the data and separate the L and R channels. So, in Meridian's application of PDM one *SA47321* DAC handles +R/-R data while the other processes +L/-L data.

This slight deviation from Philips' scheme provides a coherent noise source per DAC, thereby reducing noise by a further 3dB to -107dB (A-wtd) and distortion to just 0.00047 per cent at 0dB. Low-level distortion (0.21 per cent at -60dB) and linearity (+0.8dB error at -90dB) are similarly excellent. However, as the test results and 3D plot demonstrate, odd-order distortions still climb to

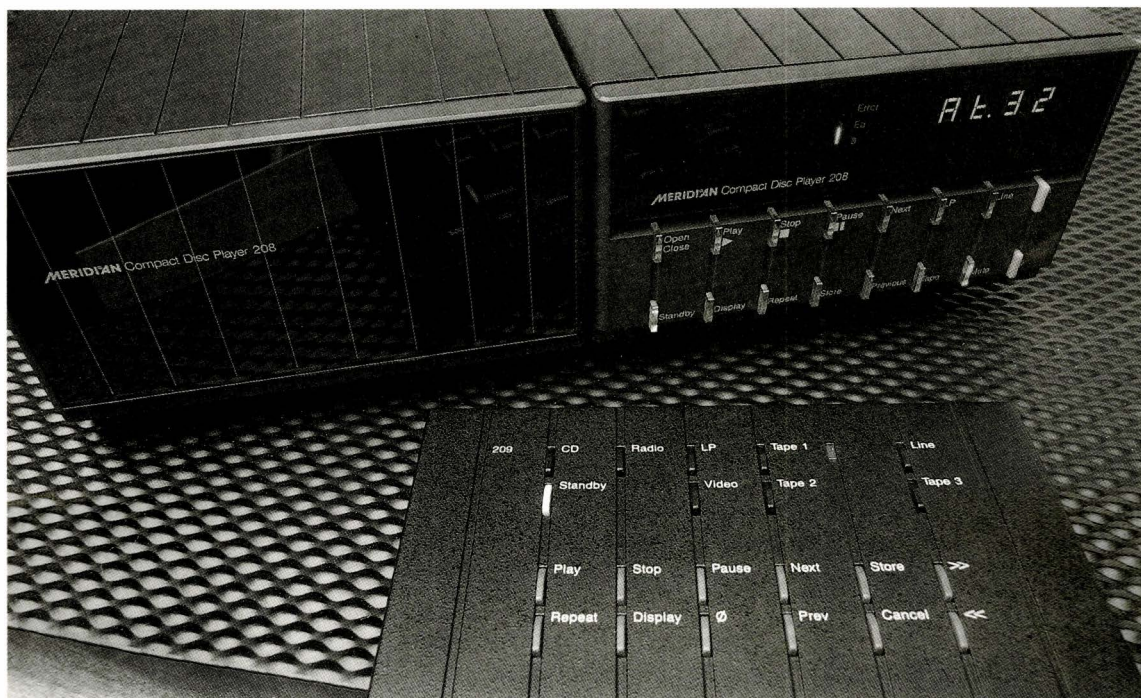
sed certain individual characteristics yet each was but a flavour, a development on a common theme. In essence the 'sound' of PDM has transpired as one of gentleness, of great poise, tactility and detail resolution; at once dynamic, always firmly in control and yet so inherently musical (nearly as good as a turntable then! - Reviews ed.)

It is this latter quality that set all four of the players apart from their respective multi-bit competitors. All enjoyed a sense of seamlessness and integration, a delightful fluidity that must surely efface many listeners' complaints of flat and unemotional 'digital' sound.

In specific terms it was possible to link the dynamic, fast and highly transparent presentation of the Deltec *PDM One* con-

verter with the lean and lucid Philips *CD840*. Similarly the warmer, smoother if no less flattering balance of the Rotel *RCD-865* was closer to the richly detailed perspective offered by Meridian's delightful *208*. Interestingly, these tonal parallels ran contrary to the expectations of single-ended versus differential-mode operation.

Meridian's *208* captured the deep and dark acoustic of Rickie Lee Jones' *Ghost Train* to good effect, the sharper rasping timbre of guitar punctuating this expectant atmosphere in tandem with precisely articulated vocals. Much the same sensation was experienced with *Rodeo Girl*, her voice couched by the warmly integrated sound of strings and drums. There seemed to be no audible discontinuity in the sound,

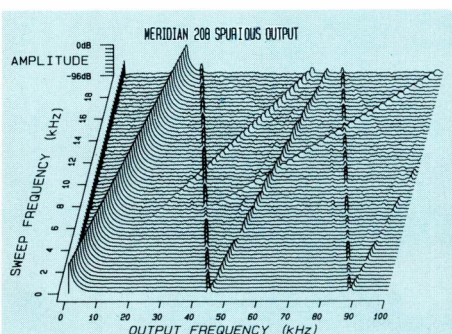
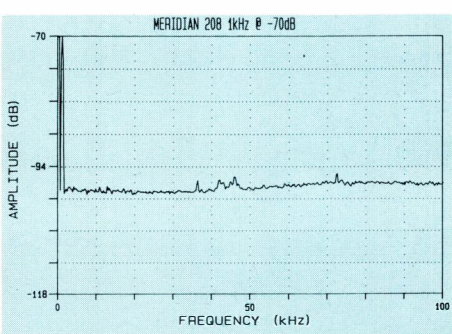


0.04 per cent at 20kHz because the common-mode rejection (CMR) techniques are biased towards even-order distortion mechanisms.

Furthermore, the -70dB 1kHz tone reveals a slightly higher audible and ultrasonic noise floor than others in this test - a feature of Meridian's passive 2nd-order LC filters (the 2nd integrator) together with the two *NE5534N* op-amps used in a subsequent differential gain block. Either way, the filters are factory adjusted to maximise the CMR ratio and attenuation of the 176kHz dither tone. The preamp section of the player utilises a discrete, FET-switched volume control (direct-out is also provided), CMOS input switching (for disc, aux and tape) with cascaded *NE5534N* op-amps forming the switched gain stage.

PDM SOUND QUALITY

The many enjoyable hours spent listening to each of these four players only served to reinforce my earlier view of a very distinct 'PDM sound'. Clearly, each player posses-



the transition from bass to high treble being smooth and unperturbed.

Rotel's player offered a correspondingly deep and resonant bass line though the upper bass was oddly 'dead' in comparison. The twang of strings was comparatively sweet and detailed, avoiding the smearing or graininess suffered by many £300 16-bit players. Like the *208*, the *RCD-865* majored on a very rich and mellifluous midband, coupled to a treble that showed surprising resolution and composure. It was unable to develop quite the depth and stage width of the *208* but the 'darkness' of the acoustic was similar, eschewing the leaner and slightly more upbeat sound of the Philips *CD840*.

So, if there was a contrast to be noted, the Philips *CD840* erred on the lean and lucid side of neutral. This lent a slight emphasis to percussive edges, training a spotlight on the natural sharpness of strings and cymbals without sounding uncomfortably harsh or bright. Indeed its delineation of treble detail was firmly up with Deltec's *PDM One*, exceedingly fluent

and sharply focused but perhaps trading this for a loss in warmth at lower frequencies.

Oddly enough, this tendency towards a slightly lean and speedy sound has been noted with earlier 16-bit players from Philips. Perhaps then this has less to do with the PDM chip and more to do with Philips' implementation of peripheral circuitry, in particular the post-PDM opamps.

Deltec's *PDM One* was similarly 'fast' with finely detailed treble, but also more convincing in its handling of bass dynamics. Music had a slightly lighter but quicker and more urgent feel about it than it had with either the Meridian or Rotel players, yet abstained from the leanness of the *CD840*. The elucidation of the rasping attack of strings was superior via the *PDM One* even though the accompanying vocals did lack the last drop of smoothness and stereo focus enjoyed with the *208*.

Turning to a disc with a more open and naturally 'airy' acoustic these divisions were rendered less obvious. Radka Toneff's exquisite vocals on *The Moon is a Harsh Mistress* (from the album *Fairytales*, but also on the Odin sampler) sounded marvellously vibrant and alive with Deltec's converter. Here the lingering decay of her voice threw up a realistically broad and deep acoustic while still preserving a vocal 'presence' of believable scale and tactility. This is an analogue recording, and the tape hiss was more obvious when listening via Philips' *CD840* - another feature of its subjective treble emphasis perhaps? Nevertheless this did not detract from the highly emotive vocals on this well recorded disc. In common with the other players in this group the *CD840* allowed my speakers to melt from view more so than I have ever experienced with multi-bit CD players.

Remarkably, the Meridian *208's* presentation was even more refined, slightly richer but also fractionally - and I mean fractionally - less transparent through the midband. The natural tone of acoustic piano was beyond reproach however. Reverting to Rotel's *RCD-865* revealed a balance that was warmer still, the piano suffering a slight 'bloom' but nevertheless still delighting in the naturalness that seems to flow from all these PDM players.

I felt the vocals were actually more evocative via the *RCD-865* than they had been via Meridian's *208*, there was just a little more feeling behind the articulation, despite the voice appearing less sharply etched as it was with the *208*. This very natural portrayal of vocals was not limited to potent female performers I hasten to add; Phil Collins' *Colours* was equally emotive in delivery.

Rotel's player offered its customarily rich and warm view of events yet was not quite as quick or crystalline as the *CD840*. On the other hand it did manage to recreate the rumbling impact of the bass line with greater conviction than the Philips

player if, once again, losing out to the Meridian in terms of control and damping. In fact the *RCD-865* enjoyed an 'analogue-like' bass, very lush and beguiling yet perhaps not as tightly focused as is possible - a highly acceptable compromise nevertheless.

Philips' *CD840* was more open and transparent in its delivery yet began to lose control during the most powerful crescendos. The crash of drums, percussion and burst of vocals combined with a slight treble 'spotlight' to harden the sound temporarily. A little extra warmth together with a hint of the control and sweetness enjoyed with the costlier *208* would not have gone amiss. This said, at a quarter of the cost the resolution, poise and refinement of the *CD840* was undeniably impressive and, in my opinion, quite unmatched by any of its 16-bit competitors. A feat of some stature for a first-generation £350 PDM player!

Moving up the scale, Meridian's player announced the slam of percussion at the introduction to the Phil Collins track with awesome but seemingly effortless potency' driving the music onward with power and conviction but without any unpleasant 'shouty' colorations. Indeed, the raw and natural energy of the music was stunning in its impact, particularly as it did not rely on an archetypal 'hi-fi' style of presentation.

In fact the *208* always sounded impressive in a genuinely musical fashion. By way of comparison the Deltec converter was no less musical yet seemed that much more precise or 'correct' in the technical sense.

It was sharp and incisively detailed but lacked the rich warmth offered by the Meridian at lower frequencies. A combination of both these attributes would represent something very special indeed!

SUMMING UP

Neither one of the four players was *startlingly* superior to any other, for though each possessed a certain tonal 'fingerprint' each was also blessed with the ability to reproduce music in a thoroughly convincing fashion. If you are tied to a very strict budget then the Rotel *RCD-865* is clearly a bargain. Similarly if you don't mind spending the best part of £1,500 on a luxury CD player then Meridian's *208* is a very strong candidate. However, I imagine Deltec's solution is the more acceptable for owners of players with digital outputs, as it represents an upgrade rather than complete replacement.

Since the launch of compact disc techniques in digital audio have continued to evolve, albeit incrementally. However, I can't help feeling that the emergence of Pulse Density Modulation represents a significant leap in technology, the type of breakthrough that comes but once every five or ten years, and this is good news indeed for those hi-fi enthusiasts who feel let down by the sound of CD.

Clearly the implementation of bitstream and PDM topologies will advance but, paralleling its multi-bit forebears, future improvements are likely to be subtle ones. Still, I'm sure the concept of bitstream conversion itself will lie at the heart of future CD players.

TEST RESULTS

	Rotel RCD-865	Deltec PDM-1	Philips CD840	Meridian 208
Channel Balance, 20Hz	0.01dB	0.01dB	0.00dB	0.18dB
1kHz	0.01dB	0.01dB	0.01dB	0.18dB
20kHz	0.00dB	0.02dB	0.02dB	0.18dB
Channel Separation, 20Hz	104.8dB	80.2dB	96.4dB	124.6dB
1kHz	102.9dB	78.3dB	97.6dB	105.6dB
20kHz	87.7dB	79.5dB	96.1dB	82.3dB
THD (at 0dB), 20Hz	-92.8dB	-76.5dB	-95.7dB	-103.2dB
1kHz	-94.2dB	-81.4dB	-99.9dB	-106.5dB
20kHz	-69.3dB	-71.5dB	-68.6dB	-67.9dB
THD vs Level (at 1kHz)				
-10dB	-87.1dB	-91.5dB	-99.1dB	-100.2dB
-30dB	-64.4dB	-75.9dB	-78.9dB	-78.9dB
-60dB	-31.1dB	-41.6dB	-47.1dB	-53.5dB
Dithered -90dB	+5.9dB (>100%)	-14.8dB	-13.5dB	-20.9dB
CCIR IMD, 0dB	-83.5dB	-77.6dB	-100.5dB	-98.9dB
Suppression of stop-band IMD	54.9dB	55.6dB	55.1dB	55.0dB
Dynamic Compression, 1kHz	0.00dB	0.00dB	-0.01dB	0.00dB
L/R Phase Error at 10kHz	0°	0°	0°	0°
at 20kHz	0°	0°	0°	0°
De-emphasis Accuracy, 1kHz	0.00dB	-0.05dB	-0.06dB	-0.09dB
5kHz	+0.05dB	-0.05dB	-0.17dB	-0.28dB
16kHz	+0.14dB	-0.45dB	-0.07dB	-0.28dB
S/N Ratio (A-wtd), w/o emp	92.9dB	94.1dB	103.7dB	-106.5dB
w emp	95.4dB	94.3dB	105.7dB	-108.1dB
Resolution at -30dB	-0.01dB	+0.01dB	0.00dB	0.00dB
-40dB	-0.01dB	+0.01dB	-0.01dB	0.00dB
-50dB	0.00dB	+0.01dB	-0.02dB	0.00dB
-60dB	+0.03dB	+0.04dB	-0.09dB	0.00dB
-70dB	+0.15dB	+0.14dB	-0.44dB	+0.06dB
-80dB	+0.38dB	+0.51dB	-1.54dB	-0.06dB
L/R -90dB	-2.32dB/-1.80dB	-0.34dB/-2.82dB	-3.58dB/-3.51dB	+0.82dB/+0.15dB
Peak Output Level, L	804.7mV	2.575V	1.772V	2.131V
R	805.4mV	2.572V	1.773V	2.087V
Output Impedance	151ohm	2ohm	200ohm	9.5ohm
Track Access Time (99)	5secs	n/a	5secs	3.5secs
Serial Number	63934945	PA17	AH008941-170073	F100080
Typical Retail Price	£300	£475	£350	£1,490

STATEMENTS

Monitoring what's happening on the high-end scene . . . This month, Alvin Gold samples the delights of esoteric American amplification, Threshold style.



Threshold amplification products are extremely impressive. They'll certainly impress your bank manager and your spine is unlikely to hurriedly forget what the power amps feel like. They're also impressive to look at and to use. Hailing from the home of the super-amp, US company Threshold has been in the amplifier business longer than most, and this shows in its conservative engineering, attention to detail and self-evident maturity. This side of the Atlantic the company's products are distributed by UK speaker manufacturer Acoustic Energy, as are the much talked about Wadia D-to-A converters.

I've been listening to Threshold's top preamplifier, the FET/TEN, and two power amps (the SA-4e and the S/550e) identical in price but from parallel ranges. The preamplifier comes in two parts, a line level section called the FET/TEN/Hi and a phono input module, the FET/TEN/PC, which cost £2,500 and £1,650 respectively, making a grand total of £4,150. The power amps set you back £5,900 each.

The power amps are classics of their type: big, essentially featureless behatted slabs, both being two channel, solid state stereo units. The S/550e is rated at 250 watts/channel with what Threshold describes as a Class A/AB output stage. The SA-4e looks the same and employs almost identical circuitry and power supplies, derated to 100 watts/channel but

Over £4,000-worth of preamplifier from Threshold. The separate line level and phono stages each have their own power supplies.

with the output stage operated in Class A (or something close: I'm not convinced the units get hot enough to be genuine Class A). Balanced 600ohm and unbalanced 50kohm input options are provided, the only other oddity (if that's the word) being the loudspeaker terminals, which don't accept 4mm plugs. I'm not going into design details here, but to flesh out the bones a little, the amps both use FET front ends, proprietary STASIS output stages with 20 plus output devices per channel (depending on model) and optical bias circuitry – plus huge, shrouded toroidal transformers the size of food processor bowls.

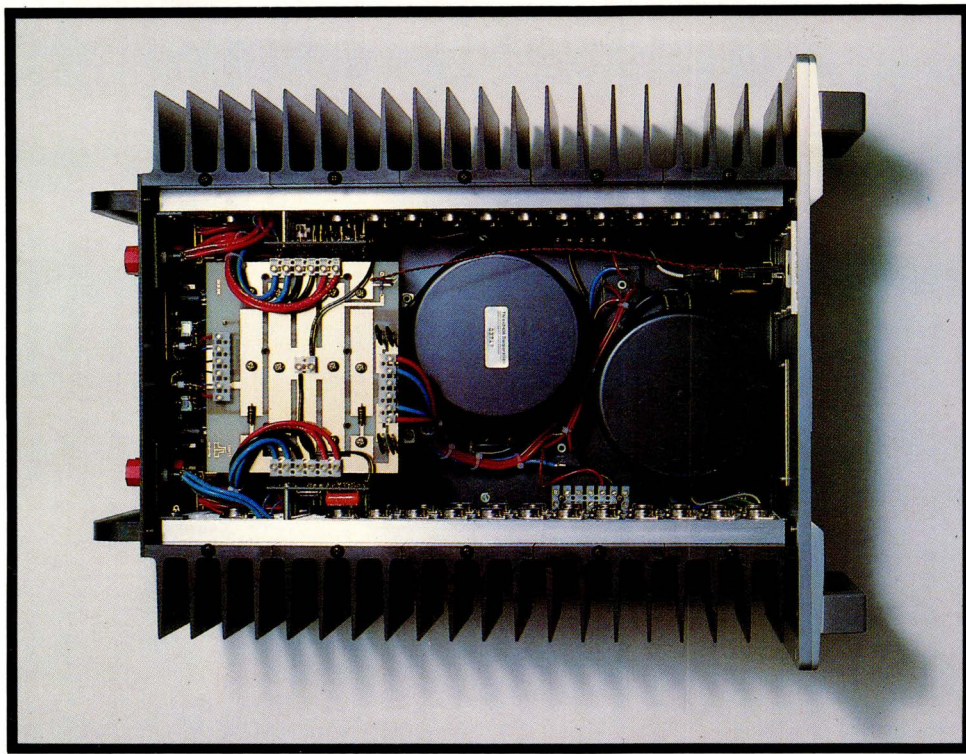
The two slim, elegant preamplifier modules are identical in size and style. Each has its own dedicated black box power supply. The line module has five inputs plus two tape circuits. One of the inputs, labeled 'phono' is in fact a line level input designed to accept the equalised output of the phono module, which is fully configurable internally for any conceivable MM or MC cartridge requirement.

Build quality and materials content are both in the very highest class, though some may question the wordy control legends. There's more than a passing visual resemblance to Roland Research in these pro-

ducts, but they all fit comfortably into the class of equipment defined (in this country at least) by Krell.

To the average British audiophile, monster power amps like the SA-4e and S/550e look like absurd overkill, suitable only for the deepest of pockets, the most palatial of homes and for systems with the deepest bass and loudest volume potentials. American amplifiers of this kind are 'muscle' amplifiers in the common perception, short on finesse, but loud and blatant. Some of these things are true, in particular Threshold is very much for the deep of pocket. But most of the other assertions are simply false. Threshold (and Krell, Roland, etc) shouldn't be confused with the mindless, wallowing V8s with squealing tyres, popularly associated with the worst excesses of butch Americana.

Good American muscle amps (and we are talking about muscle amps of course) need not lack finesse, and are extremely well suited to medium to low volume use (otherwise they'd be no good at high volumes). They also work brilliantly with moderate, even small loudspeakers in modest rooms. Initially I got to know the Threshold equipment with a small pair of Monitor Audio speakers (*Studio 10s*), and what I learned with these little speakers hasn't been added to a great deal by the bigger loudspeakers I've used since – from Apogee, JBL, Tannoy and Vandersteen. More to the point, the Threshold did its



thing with these little speakers, running rings around most other amplifiers, irrespective of origin.

The Threshold is all about being utterly consistent, irrespective of the nature of the load or power level – soft as much as loud – and utterly, utterly predictable (in the right sense) and reliable. I confess I'm still not *quite* sure *exactly* where the Threshold equipment fits in the hierarchy of American super amps, but it's very close to the top, and good enough to make a nonsense of most (not all) of the competition.

Differences between the two power amps are smaller than you might think:

however, the Class A amp paints a slightly bigger, bolder picture overall, and tends to hold the attention a little better. There's no Class A valve-like sloth here. But if it's all boiled down to musical values, both do a pretty similar job.

It's a beguilingly seamless one too. The phono input, line stages and power amplifier appear to be completely in tune with each other, and offer consistent performance standards, insofar as it is possible to make statements of this kind about products that actually do different jobs. The pre/power combo sounds big and bold, with superb, layered yet at times curiously unatmospheric stereo soundstaging, with

excellent delineation of dynamics generally and of individual instruments specifically.

Like all the really good amps of this type, it sounds quite unstoppable and never sounds strained. Bass is solid and deep, yet the amp also sounds a little undemonstrative, tonally cool and perhaps even a touch hard, though there's nothing you can really put a finger on at the same time, the informative yet rather hands off character makes listening to the Threshold unusually easy, perhaps because there is less of a sense that the music – or the listener – is being manipulated.

HIGH-END UPDATE

Watch out soon for some new high-end electronics from French company Vecteur. Although known only for its cables in this country, back at home base Vecteur is well known as a manufacturer of some seriously esoteric equipment – especially weird-looking and truly wonderful loudspeakers. A legend in its lifetime, sadly the Vecteur turntable is no longer in production.

One of the leading lights at Vecteur was designer and audio guru Yves Bernard Andre who these days runs his own company building the highly-regarded YBA amplifiers. Now Vecteur is to market its own solid state amplifiers too. They won't come cheap: a 35watt Class A power amplifier is projected to cost around £3,000 in the UK, with a matching preamplifier a further £2,000. The Vecteur amplifiers should be here in time for launching at the Penta hi-fi show in September. UK distributor is Presence Audio. Tel: (0403) 891777.

The Graham *Model 1* unipivot tonearm, discussed by audiophiles the world over in the sort of reverent tone normally reserved for the ultra rare Breuer pickup arm, is now available in the UK. Distributor is The Final Upgrade of New Barnet, Herts, which also handles Ensemble and Solen.

Manufactured by Graham Engineering Inc. in Burlington, Massachusetts, the *Model 1* features an interchangeable arm wand using a special Bendix aerospace connector. The silicone-damped unipivot design is reckoned to have lower bearing friction than any known pivoted tonearm, while wiring is van den Hul silver and all connections made with silver solder. An output junction box using the same silver wire and terminated in either Tiffany or WBT connectors permits the use of heavy interconnects to the preamplifier. Counterweight adaptors are available which ensures compatibility with *any* cartridge. Price is £1,595. Further

details from The Final Upgrade. Tel: (01) 440 2588.

Audiofreaks, distributor of Kuzma, Conrad-Johnson, Sound-Lab, etc, is now the UK agent for Tiffany connectors. Details and prices from Audiofreaks. Tel: (01) 948 4153.

Lectron of France has produced a £1,000-ish integrated valve amplifier. Like Bill Beard's *BB100* integrated amp, the Lectron is a line-only model which is most likely to find its way into homes which don't have record players. Distributor is Electroactivity of London which is also marketing the Mörch tonearm from Denmark (£595-£650) and SP Audio preamplifier (£1,800), the latter item a British-built device which already has a kind of 'underground' cult following. More details on these components as and when we learn more. Electroactivity has a new telephone number: (01) 445 6151.



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Rotel RA840BX4	379.95	389.95	409.95	419.95	429.95	459.95	499.95	499.95
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Rotel RA870BX	429.95	449.95	469.95	499.95	519.95	549.95	599.95	599.95
Kenwood KA5010	349.95	359.95	389.95	414.95	439.95	469.95	499.95	499.95
Nad 3225PE	289.95	299.95	314.95	339.95	359.95	374.95	424.95	424.95
Nad 3020 i	279.95	289.95	309.95	329.95	349.95	364.95	409.95	409.95
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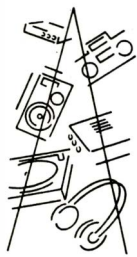
CDs

- Denon DCD520 add £50
- Denon DCD620 add £80
- Denon DCD820 add £130
- Denon DCD920 add £180
- Marantz CD40 add £80
- Marantz CD50 add £130
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- Yamaha CDX710 add £170
- Yamaha CDX810 add £130
- Rotel RCD855 add £70
- Sony CDP770 add £40
- Technics SLP202 add £80
- Technics SLP222 add £120
- Technics SLP333 add £170
- Technics SLP555 add £170

TURNTABLES

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- Dual CS505-3 add £25
- Dual CS430 deduct £20
- AR EB 101 add £100
- Nad 5120 deduct £20
- Revolver black inc. arm add £100
- Revolver Rebel add £40
- Systemdek + moth add £150
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PERSPECTIVES

To most of us recordable CD (CD-R) is but a dream. So when Hi-Fi Choice learned that a recording studio in central London had just bought a CD-R machine from America we were round there like a shot. Andy Benham reports.



The Future Now

About 18 months ago everyone was talking about recordable CDs. Taiyo Yuden, the Japanese manufacturer of That's tape, put out a news release saying that recording CD players and blank 'recordable' discs would be widely available by the middle of 1989.

The discs, we were told, would cost around £5 each with the recorders working out at "about £180 more than a good conventional CD player". Some weeks later we learned that Taiyo Yuden had joined forces with Sony to form a company called START Lab Inc. With Taiyo Yuden's software and Sony's hardware expertise, START Lab looked like making the dream of CD-R a reality.

To say that this was over optimistic would be an extreme understatement. The discs vanished without trace, the couple of photographic samples that were bandied around to journalists at the launch proving to be the only sighting of this exciting format for the next 18 months.

SURPRISE, SURPRISE

It was all the more surprising, then, when in January this year the professional sound industry began receiving press releases from London's Tape One studios announcing the arrival of the first CD-R machine in this country. Tape One studios, one of the London's leading mastering facilities (you'll find its name inscribed in the run-out groove on many of your LPs), is now

On sale to recording studios everywhere: Yamaha's CD-R machine is controlled by an IBM-based personal computer. Blank discs are manufactured by Fuji.

offering a commercial recordable CD service to the professional sound industry, albeit at an asking price of a cool £200 per disc. Your *Hi-Fi Choice* reporter, camera and flash gun at the ready, was round there like a shot!

The Tape One announcement was followed by a flurry of promotional activity by START Lab which is now offering a postal service whereby master tapes can be sent to its headquarters in Japan and a recorded CD returned to the client a couple of weeks later. One enterprising individual, Ernie Eban of West London, has gone so far as to commission a limited print run of discs containing a recording of natural sounds (waves breaking on a beach, and the like) and has begun punting them around for a mere £20 each.

So, after 18 months of deathly silence, has CD-R finally arrived? The answer is yes, but only for professional users. At present the pricing structure rules out any involvement with the domestic market, unless of course you are prepared to spend upwards of \$20,000 for a recording system and then shell out anything up to \$80 for each blank disc.

The fact that CD-R machines are alive and working shows that it is not any major technological problem that has kept them

away from our hi-fi systems, rather the pricing structure. And gone are the music industry's fears that market stalls across the land might soon start filling up with bootleg CDs, as the system has been priced in such a way as to put it out of reach of the average consumer.

Currently there are two CD-R systems available which work in quite different ways. The START Lab (Taiyo Yuden/Sony) system is based on the bi-polymer discs which were reported on in great depth at the time of their launch 18 months ago. The system installed at Tape One, on the other hand, is based around a disc developed by Yamaha and now manufactured by Fuji, along with Yamaha hardware which we understand has been developed in co-operation with Philips. Funnily enough, visitors to Tokyo's Audio Fair at the tail end of last year learned that Philips is also the European agent for the START Lab CD-R system.

REFLECTIVITY

A major problem in the development of CD-R concerned reflectivity. On a conventional CD a series of pits are read by a laser beam, the light being reflected back from the disc to a sensor. For a CD-R disc to play on the millions of CD players already in

homes around the world the finished CD-R must reflect back enough light to enable the player to reconstruct the signal. The Yamaha (Fuji) discs use an elegant solution. Inside a clear plastic protective sleeve there is a layer of opaque recording medium which covers up a highly reflective layer of metal below it. By using a comparatively high powered laser, the Yamaha CD recorder punches holes in the opaque layer to leave exposed the reflective layer below.

Obviously this is a one-way process, as once the disc has been recorded on you can't go back and re-fill the holes in the opaque layer. So the Yamaha disc, like the Taiyo Yuden disc, is what is known as a WORM (Write Once Read Many) disc.

THE SYSTEM

The system itself is nothing special to look at, just a couple of standard sized boxes which could be quite easily mistaken for an upmarket CD drive and D-to-A converter. Perched on top is the computer which runs the software which is the brains of the system, enabling the recording unit to talk to the encoding unit and also to communicate with the machine supplying the digital data, in this case an industry standard Sony *PCM1630* digital tape machine.

Providing the data to be recorded is supplied in digital form, and P and Q coded (see below), all the operator has to do is enter a table of contents and timings, via the standard computer keyboard, and this information is then written to the disc's table of contents at the same time the music is recorded. A detailed master sheet is then printed out to show the engineer exactly what has been recorded. A big advantage of this system is that it is fully compatible with similar systems in use at CD plants, thus data recorded on tape by the PC software (known as the 'PQ junior') can be read and processed by any existing editor and vice versa.

Keying in this data costs around £35, with a full length disc costing around £195. However, if you haven't got a PQ coded 1630 tape to work from, ie you walk in with any old tape, then normal CD mastering charges are applied, ie from £300 upwards.

P & Q codes: For those unfamiliar with these codes perhaps a quick word of explanation is in order. They are used to give the CD player information about the positioning of the tracks. The P sub-code is a simple track separator flag that is normally set to zero during music and the lead-in track, but which changes to one at the start of each selection. A CD player uses the P sub-codes to accurately cue up the start of each track or selection. In the CD's lead-out track the P code is switched between one and zero in a 2Hz rhythm to indicate the end of the disc. The Q sub-code is a more sophisticated multi-bit control code which contains data such as the track number and time.

The two box Yamaha machine consists of the EFM encoding unit and the optical recording unit. The EFM encoder converts the incoming PCM signal from the master tape to EFM (eight to 14) data which is fed directly to the optical recorders and on to the disc. At the same time standard timecode from the 1630 is synchronised to CD timecode and PQ data is written into the disc's table of contents. The blank front panel of the recording units is explained by the fact that nearly all operations are controlled by the PC. The high power recording laser is expected to last for around 6,000 hours, although this is really a guesstimate as actual figures will only become available as the first recording units reach the end of their laser life.

The actual hardware costs around £40,000 and as such its appeal is limited to relatively 'free spending' applications. At present there are over a dozen systems up and running in the US, used mainly by record companies for running off a quick 'check CD' before the masters are sent off to the plant for the full run.

Continued on page 43

Bill Foster at Tape One studios in London. His clients - record producers, etc - can have a demo CD, a 'CD ref. run off' in an afternoon.





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THE CLIENTS

As Tape One's Bill Foster explained: "It is principally a system that will appeal to musicians and producers who want to hear their work in its finished quality, before they send it out to a pressing plant. The universal acceptance of CD, as opposed to the limited availability of R-DAT, also means a huge potential for radio and club promotion.

"The clients coming to us now are primarily groups that are making a CD. They want both the band and the producer to hear the CD in its finished form.

"In fact people are using it in exactly the same way as a playback acetate. Acetates were cut before the lacquers to check that everything was OK. They used to be called refs, hence the name CD ref.

"It's also ideal for shows and exhibitions but we've only had the system in for a month, and we were shut for two weeks over Christmas. I'm only now beginning to address the theatre market. If a theatre wanted our services then obviously we would vary the cost depending on how much material there was. Obviously it would be a lot cheaper if there was only 20 minutes of sound track. In this case they would have a 1630 made and then we'd make up a couple of CD copies, maybe one to have at the stage side and one to have in the manager's office in case of loss. And if one got damaged another could be made from the master tape."

A large part of the cost of the disc recording service is the actual outlay for the discs themselves, as Foster points out: "Discs cost us between £70 and £80 depending on the price of the dollar, so it's not a Camden Market bootleg job."

COUNTING THE COST

All this seems a far cry from those early days, 18 months ago when the idea of recordable CDs was first aired in the press. Taiyo Yuden went on the record as saying its discs would cost around \$5 each and that the machines would work out at "about £180 more than a good domestic machine."

These figures have proved to be optimistic to say the least and although both the START Labs system and the system outlined above are up and running the cost effectively precludes them ever crossing over into the domestic market. So what-ever happened to CD-R for Joe consumer? Yamaha would only say that it has no intention of releasing CD-R on to the domestic market, preferring to see it used in studios and for computer applications such as CD-ROM.

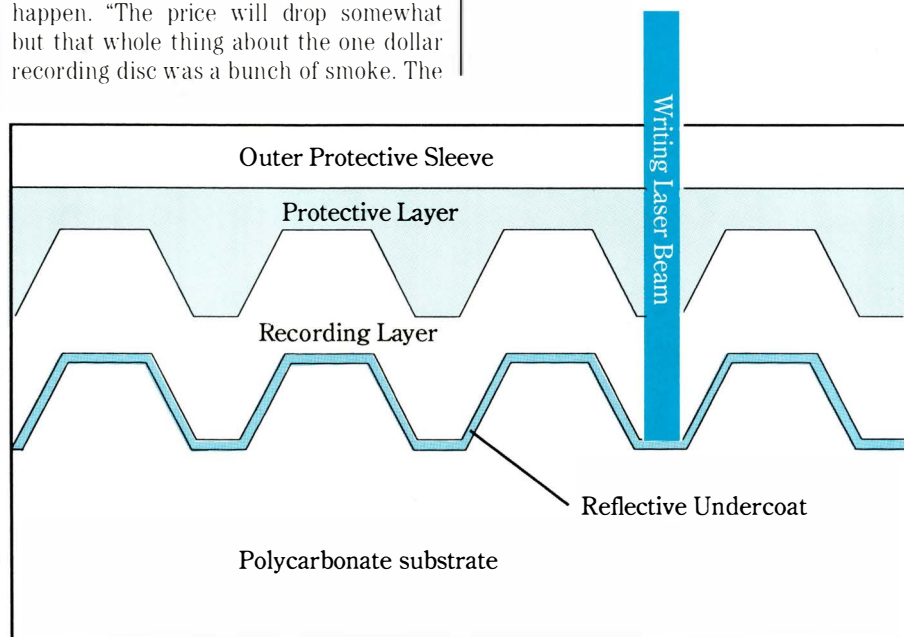
As to the cost of the discs themselves, it seems that someone, somewhere, is determined to keep the blank disc price so high that piracy will never be a problem.

Indeed, in an interview with One To One, an international trade magazine for the mastering, pressing and duplication

industries, START Labs' Product Manager Mr Yamada said: "The company is not planning to offer a domestic version until the copyright problems have been resolved. We put a lot of emphasis on copyright so we are very careful about copyright issues.

"In December 1988 we visited Mr Thomas at the IFPI in London and explained our policy and the media itself also stating that we are not going into the consumer market unless the copyright issue is resolved. Since that time discussions with the IFPI have been conducted through Philips and the Sony Corporation so we haven't had any further contact."

Philips, perhaps predictably, had nothing to say on the matter. When I put the question of the original low cost Taiyo Yuden discs to Russel O Hamm of the American company Gotham, which is supplying the Yamaha discs, he agreed with the generally held view that it would never happen. "The price will drop somewhat but that whole thing about the one dollar recording disc was a bunch of smoke. The



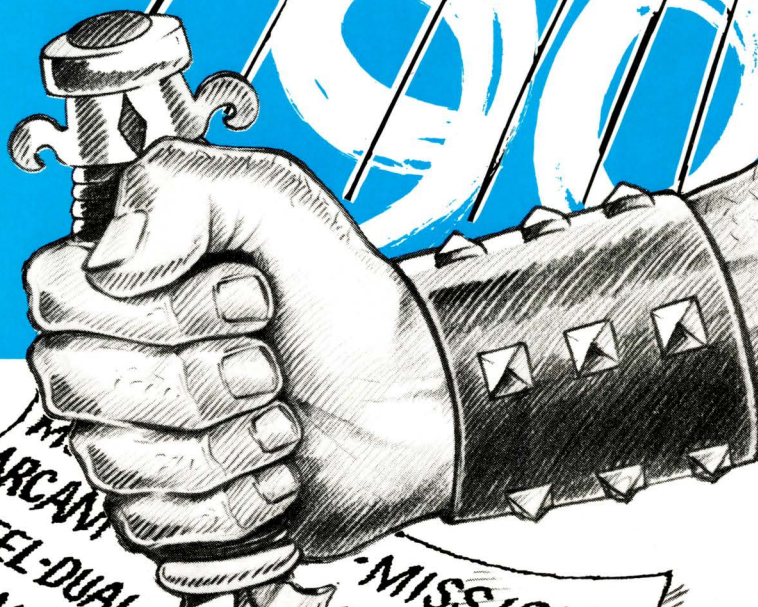
Taiyo discs are probably going to be around 50 dollars. OK, the material to make the disc may cost around a dollar but that doesn't account for the licensing charges; Philips gets its piece, TY gets its piece and suddenly the actual price of the disc bears no relation to the cost of the materials."

Hamm's estimate of the future cost of the disc may prove to be a little on the high side, particularly as the START Labs project has been talking about prices starting from around £20 per disc to include the recording, but clearly the chance of Camden Market filling up with bootlegs is being taken extremely seriously by all parties concerned. Let's face it, with CDs still retailing at the outrageous price of \$11.99 or more there is a lot of money to be lost.

Just what will happen to the CD-R format remains to be seen. If the general reaction to DAT is anything to go by it will be a long time, if not an eternity, before consumers are ever allowed to get their hands on it.

Yamaha's CD recorder uses a comparatively high powered laser to punch holes through the opaque recording layer on the blank disc, leaving exposed the reflective layer below.

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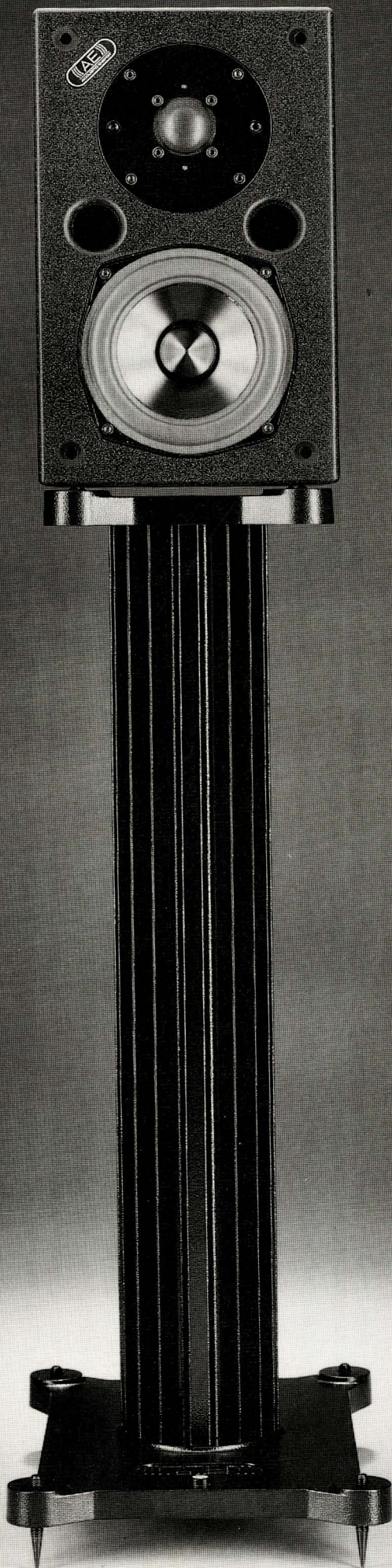
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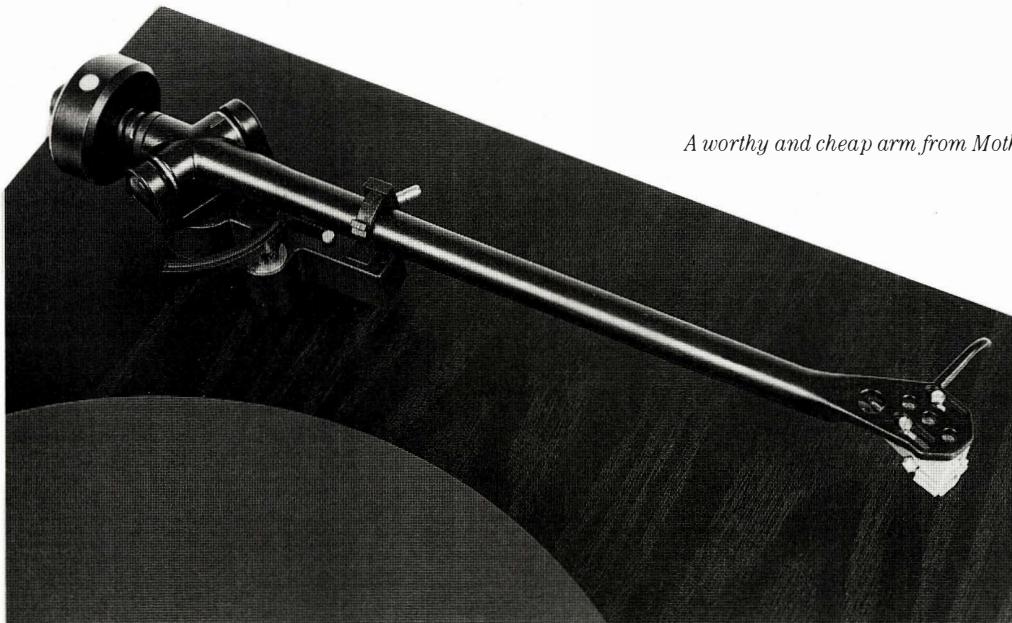
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READERS WRITE CHOICE ANSWERS



A worthy and cheap arm from Moth.

10 YEARS ON . . . CD OR NOT CD?

Over the past ten years I have accumulated a range of hi-fi equipment that has become increasingly unbalanced and now I face the dilemma of whether to opt for a CD player rather than upgrade the turntable.

The original (student days) system takes the form of a Thorens TD160BC turntable (with Linn mat and modified suspension) fitted with a Linn Basik LVV arm and A&R P77 cartridge. Target stands support both the turntable and the Mordaunt-Short Pageant Series II speakers which are driven by a Nikko NA-690 amplifier using 10m of Monitor PC cable. More recent additions include the Nakamichi BX2 cassette deck and the superb Arcam Delta 80 tuner.

I have a very mixed record collection consisting of 160 modern and 40 classical LPs. It is the classical side of the collection that I wish to expand.

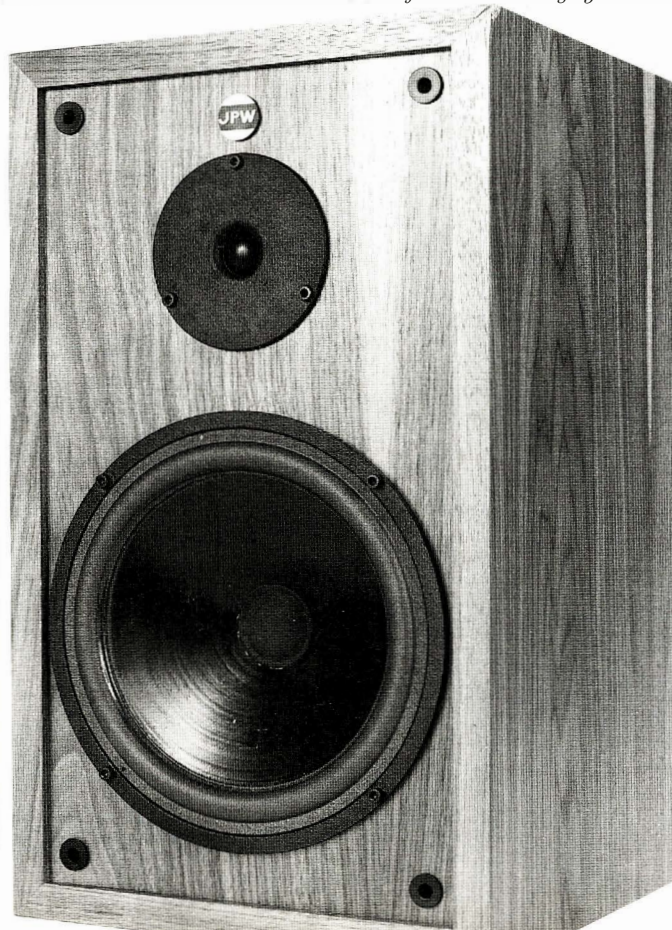
Currently the system sounds good but has a harshness which I attribute to the amplifier. With £500 to spend I want to remove this weak link and upgrade to an Arcam Delta 60. However, this leaves my source looking pathetically weak. Given the fact that an increasing number of recording companies are not producing classical LPs any more (eg Deutsche Grammophon) and it is this side of the collection that I wish to expand, my dilemma is as follows.

Do I upgrade my turntable or do I keep the existing unit and invest in a CD player? Having had an excellent demonstration of the Arcam Delta 170/Black Box combination I'm convinced that CD can rival all but the very best turntables. However, I cannot afford the Arcam CD or the Linn Sondek to which I aspire. So what do I do? Should I side-step to a Rega Planar 3 or wait until I can afford a Linn Axis? Rave reviews

in *Choice* of the Marantz CD583 seem to indicate that this could be the inexpensive solution. But would it be of sufficient quality in relation to the Arcam/Mordaunt-Short combination?

JOHN TUNNICLIFFE,
WINCHESTER.

It would seem that the future of the classical LP is very gloomy indeed and it would be illogical therefore to encourage you to



supposedly have a more appealing sound than the 16-bit machines that have ruled the roost up until this year. Although still very new the Philips 1-bit digital to analogue conversion system has won over some of the reviewing fraternity's sternest critics and looks likely to feature highly in digital's future. This isn't to say that you should abandon your Thorens - in fact it would be worth upgrading with a Moth arm, which is very good value at £78 and a significant improvement over the LVV.

JAZZ SYSTEM

Can you advise me on a system for a friend who owns thousands of jazz albums but listens to them using a mediocre system and one damaged loudspeaker! After two years of nagging he has decided to invest in a new 'hi-fi' and has entrusted me with the task of assembling a system worthy of such a substantial record collection. Although the budget isn't unlimited, cost considerations are secondary to the need to acquire a system that will give the highest level of music reproduction without the need to upgrade for some time.

Obviously a turntable will be the primary source but a tuner and cassette deck are also required. Given two possible budget limits of £1,500 and £2,500 what equipment would you suggest we audition?
C. PRYCE,
LONDON.

You're right, thousands of jazz albums deserve a pretty good record player, but happily £1,500 or even £2,500 should be equal to the task. Given the lesser figure we would recommend the Systemdek IIXE equipped with the Audio By Design platter and arm base kit, Audio Innovations Inertia arm and Goldring G1042 cartridge, Kelvin Labs integrated amp and JPW AP2 loudspeakers on top of hefty Pirate or Foundation stands. Cassette and tuner operations could be handled by a variety of different brands but one that comes to mind is Denon with its DR-M400

JPW loudspeakers - for all that jazz.

cassette deck and TU450L tuner which make a sonically competent and visually matched pair.

The above system just about hits the £1,500 target but could be reduced by substituting a Rotel RA840BX4 amplifier for the Kelvin at a £150 saving. Also, the turntable could be used without the upgrade kit and with a Moth arm, saving about the same amount again.

Working within the higher budget is a little more difficult but here goes: Voyd Valdi/Audio Innovations Inertia/Goldring 1042 turntable, Audio Innovations Series 500 amplifier and Snell Type K loudspeakers with cassette deck and tuner from Rotel in the form of the RD865 and RT830AL. This combo just about hits the ceiling without including heavyweight stands at around £100 which are a must.

Due to the subjective nature of hi-fi you will not find many dealers or reviewers who agree with this, or even one another about what is the best system for a given price, and inevitably if the dealer you visit doesn't stock all of the above brands he/she will attempt to persuade you that the alternative offered is superior. That's business, but before you part with the ready make sure you get to hear one of the above combinations.

hearing the aforementioned Naim tonearm I was bowled over by the sound quality that the ARO offered. This is not to decry the Ekos but in comparison it sounded forward, hard and aggressive.

My query is, what tracking force should I use with my Linn Karma in the ARO? I have found that 1.85 gram sounds best, but as this is outside the 1.5 to 1.7 range recommended by Linn, will I damage the cartridge or reduce its lifetime?

Also do you think it's worthwhile investigating RATA Torlyte stands for my Isobariks and LP12 in place of my current Linn and Sound Advice supports? M. S. LOCKER, NUNEATON.

With regard to your tracking force query, Linn does not recommend that much above 1.8g is used. Paul Messenger on the other hand uses much the same downforce as you. (Also see this month's Personal Messages where the Ekos/Aro saga continues.) However, because of sample variations, using a tracking force outside that recommended is sometimes necessary to get the best out of a cartridge. It's not likely to increase wear and certainly won't damage it.

On the stands and supports

Isobarik front it would be worth borrowing some Torlyte stands if you can, and also some really heavy filled stands if they are available – the Pirate ones made for Snell Type Es might work.

CARTRIDGE CONUNDRUMS

I read with interest your review of the Technics X1 midi system and consequently purchased one to use in the sitting-room. My old system was moved to the study for more serious listening.

Unfortunately, I got carried away, and on the basis of your equally excellent recommendation I purchased an Audio Technica AT95E cartridge for my old system which has enhanced it tremendously, even to the extent that there is now a noticeable difference between the old and new set-ups. I say 'unfortunately' because I now realise the effect a cartridge has on reproduction and alas the AT95E doesn't come in the T4P fitting used on the Technics.

Could you possibly recommend a cartridge for under £30 that will fit my Technics X1 system and give a similar upgrade to that achieved with the AT.

PETER BEARD, DERBYSHIRE.

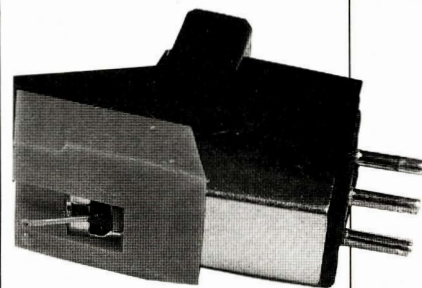
Due to the nature of hi-fi reviewers' turntables, ie tonearms with half-inch bolt mounting, T4P fit cartridges are not generally reviewed although in the past we have listened to this type of cartridge fitted with a suitable adaptor.

There are several companies including Technics and Ortofon which make T4P fit cartridges and it would be worth upgrading to a better one purely for the sake of record health. The quality of stylus generally found on midi system decks is pretty poor and liable to damage your records because of mistracking. That said, it's not worth spending a great deal as the quality of the deck and arm will limit the absolute standard of sound quality available.

WHAT NEXT?

Recently I've been undertaking a programme of upgrades to my present system which comprises AR EB101, Mission Cyrus One II, Creek T40 and Tannoy Mercury S. The improvements began with a Linn K9, two five metre lengths of Cyrus cable and QED Incon P1-Gold. Needless to say all were chosen from a short list compiled with the invaluable help of your magazine's Directory.

The latter two upgrades have cured me of my cynicism concerning the merits of quality



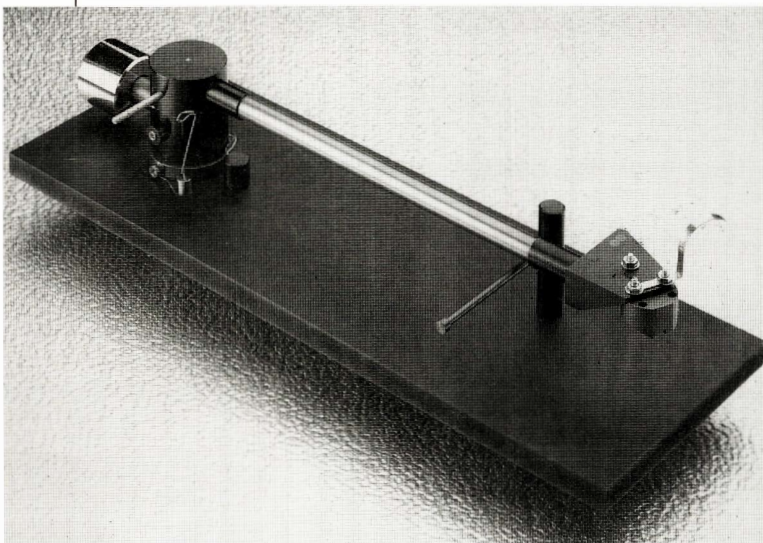
Audio Technica's AT95E, a budget scorcher but no use with midi systems.

speaker/interconnect cable. I was somewhat gob-struck with the improvements in depth, clarity, bass resolution and most apparent (in speaker cable) the smooth top end. And this brings me to my question. What do I do next? With reference to the improvement I experienced with cable upgrades, would you consider that upgrading tonearm cable and/or tonearm, the former with the Quantum Superior range for instance, to be worthwhile?

STEPHEN WHITTLE, LANCASHIRE.

Cables are important and influential but so is hardware and in this situation you would be better off upgrading the arm instead of the arm cable. Assuming that your EB101 is fitted with the standard AR arm the most cost efficient upgrade would be to replace it with a better arm such as the Moth (£78) or the Audio Innovations Inertia (£150) depending on available funds. Neither of these arms have plug-in arm cables, thus upgrading arm cable would be a fiddly business involving very careful soldering. However, the Inertia has a good quality Audio Note cable fitted as standard.

What else? You can try out some inexpensive tweaks like replacing mains leads with solid core twin-and-earth cable, screwing cross head wood screws into the floorboards beneath the spikes of your turntable table – assuming you have one. If you don't then this is an area worth investment. Also try out alternative interfacing between speakers and stands; if Blu-tack sounds good then get hold of some Ax Blacktak – it sounds even better and costs only £2.



TO NEARM TRIBULATIONS

As a long time Ittok user I had been deliberating whether to upgrade to an Ekos or an ARO, but having found it impossible to hear a demonstration of an ARO I purchased an Ekos and sat back. Then I read Paul Messenger's Personal Messages in last May's issue where he enthused about the ARO. This stimulated me to go back to my dealer and request a demonstration as soon as an ARO became available. On

Analogue Rules OK. The debate continues...

front we haven't tried the Torlyte stands with Isobariks or the LP12 but we know of quite a few individuals who swear by the RATA stand as a turntable support. One alternative that we have experienced and enthused about is the Mana Acoustics table which works extremely well with the Linn and most definitely is worth investigation. On the



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CHOOSING AND USING . . . CASSETTE DECKS

What factors should you take into account when purchasing a cassette deck? Alvin Gold offers advice.

According to the predictions of some industry pundits a few years ago, compact cassette should by now have been consigned to the great dustbin in the sky reserved for the eight-track cartridge, the Elcassette, Laservision and Video 2000, along with other obsolescent manifestations of outdated or unwanted technology. As CDs are in the process of replacing records, DAT was to have usurped cassettes, but that has yet to happen, and probably never will.

No doubt DAT will be relaunched some time in the next year or two, but in a severely disabled form with its ability to record freely from certain audio sources curtailed, and in any case is restricted to top end applications where the necessarily high prices won't matter.

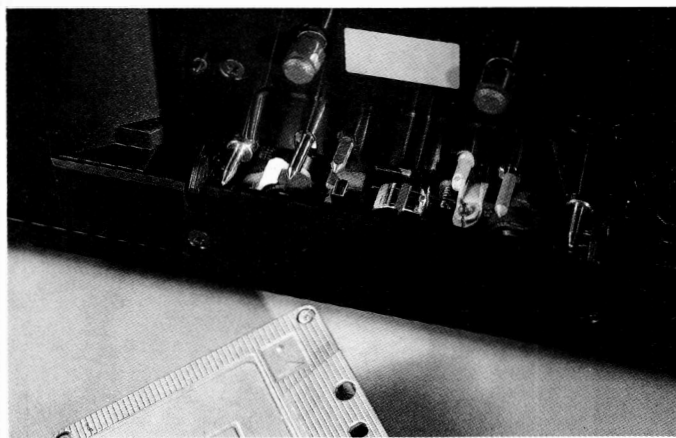
The message then is that the humble cassette trundles into a new decade, consolidating rather than loosening its grip on the market. Cassettes are cheap, flexible and insensitive to being moved around (unlike any disc based system), but most of all they're widely understood and used, currently outselling all other prerecorded media by miles.

Though the future of the cassette seems assured, this is not to say it will escape the winds of change. Potential buyers should take into account the imminent introduction of a new noise reduction process called Dolby S, which is both extremely powerful and yet is claimed to provide a degree of compatibility with Dolby B. That last claim should be taken with a pinch of salt, remembering that Dolby Labs said much the same of Dolby C. But the company also claims that a Dolby S deck will perform comparably to digital media with respect to noise. Dolby clearly sees the process as one that will eventually usurp Dolby B for prerecorded applications, so its importance should not be underestimated.

You can't buy a Dolby S cassette deck yet, in fact you'll

probably be lucky to see one this side of 1991. But anybody buying an expensive cassette deck should at least take Dolby S into account.

What other factors should you take into account? Obviously sound quality is a primary attribute, and is discussed fully in the reviews. Suffice it to say here that a good budget price deck (with the emphasis on 'good') costing say £100-£150, will be able to make recordings free of obvious problems like excessive noise, instability or varying pitch, at least when listening reasonably casually.



However, something better will be needed for intensive use in a high resolution system, and you'll find ample rewards for paying extra, the point of diminishing returns becomes a factor only well into the several hundred pounds territory for cassette decks.

One advantage of better quality cassette decks is that they make more of the tapes you feed them. Ultra-quiet Type IIs for example can often be used to record even quite wide range music without Dolby noise reduction yet without obvious signs of hiss at normal volume levels given an inherently quiet deck with good heads. It's surprising how noise free a sympathetically chosen deck and tape combination can be, and omitting noise reduction processing generally adds clarity and articulation to the sound

which is, literally and metaphorically, less manipulated. Dolby HX Pro assists here, since it helps prop up flagging high frequency dynamics on musical passages recorded at high level, keeping compression at bay a crucial few decibels more than otherwise would be the case.

Metal tapes tend to be noisier (as well as being more expensive of course), and consequently it's harder to dispense with Dolby noise reduction. Nevertheless, metal tapes remain the best option for capturing music's solidity and dynamics since the

of the recorder.

In other words, you get what you pay for, a comment equally applicable elsewhere. The range of features offered by modern cassette decks has barely increased over the last couple of years, but a greater proportion of decks have soft-touch logic controlled transports (as your VCR has had for yonks), effective intro-search and track search options, memory counters, etc.

Electronics are being used for more and more functions of course, but sometimes this backfires on the user who should beware that not all logic decks can be left in record standby using an outboard timer (this facility is automatically available with decks featuring mechanically latching transport controls) as the tests that follow demonstrate. In one or two cases, even Dolby switching is defeated when the player is turned off, leading to the near certainty of frequent operating errors.

Several of the more sophisticated features found on some decks add considerably to convenience and utility but at almost inevitable detriment to performance standards. Dual transport decks – which allow tape to tape dubbing and sequential play – are predominantly low in price and don't even pretend to offer high standards of sound quality. Auto-reverse decks which certainly aren't restricted to any particular price bracket, involve considerable complication to transport design and almost guaranteed qualitative losses, if not in normal use, then certainly when playing side two with the tape running in the reverse sense.

Technological fixes are available to bring auto-reverse standards into line with unidirectional standards, but they don't come cheaply and these days are rarely employed against a background of an apparently diminishing interest in the breed. I wonder if deck manufacturers are reading the right messages from this diminishing interest?



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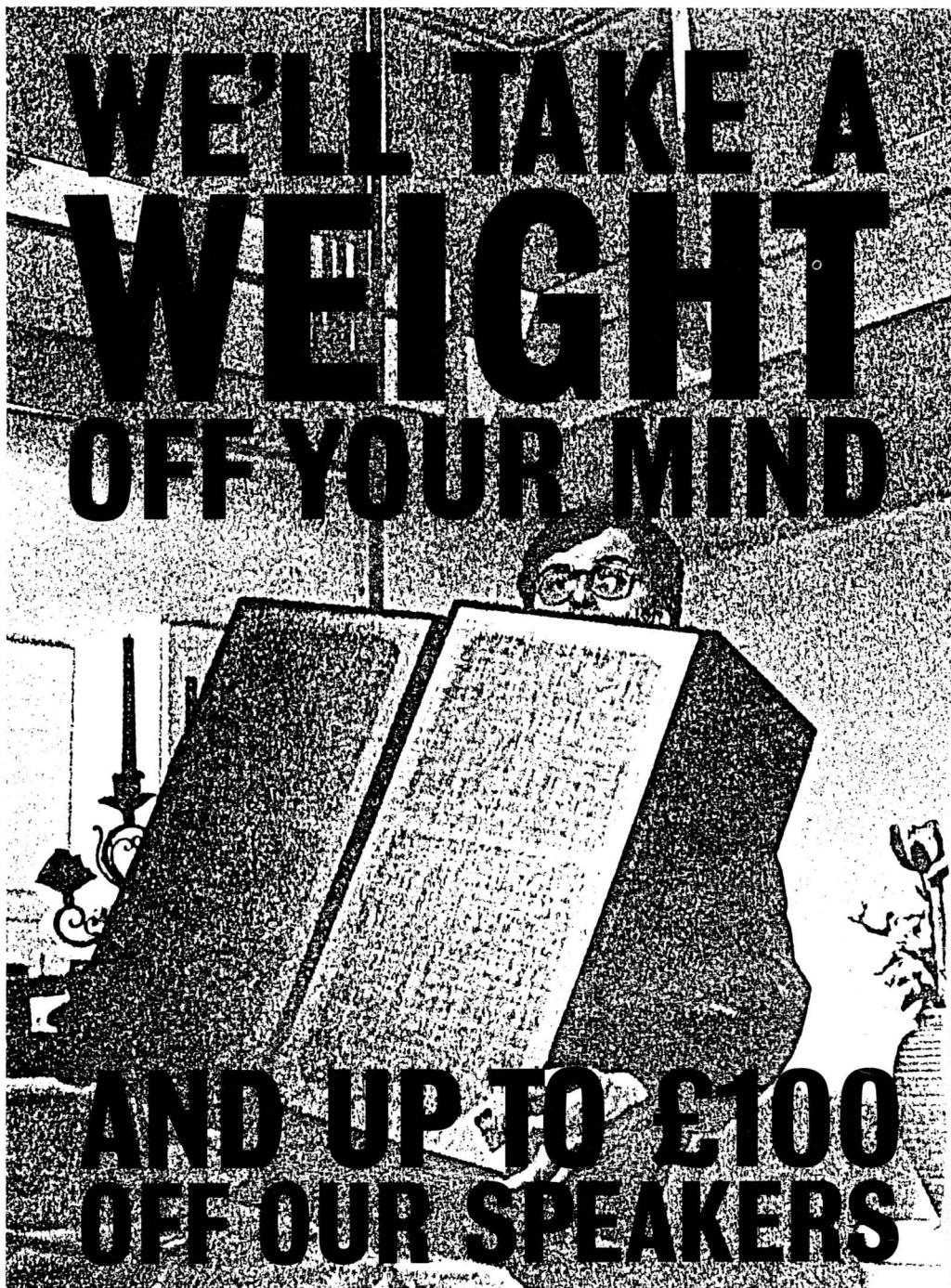
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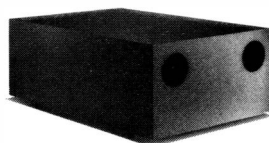
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AKAI GX-65

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With an emphasis on performance and engineering rather than gadgets, the natural constituency for this large and impressive looking deck is the audiophile community. This is a serious design whose most serious attributes are the dual capstan transport and discrete record and playback heads with automatically selected tape/source monitoring. The last qualification is important since Akai uses separate record and play gaps even for its standard decks, but they don't offer the GX-65's off-tape monitoring whilst in record mode.

This Dolby HX Pro-equipped Akai can be used with an infra-red remote control handset, which is available at extra cost. The recorder's own control set is very straightforward and traditional in approach. The electronic tape counter has memory stop and play, whilst the reset and memory keys are given a prominent position just above the main control bank, which is a good idea. The logic transport controls are a model of clarity. In a row along the bottom edge are the remaining controls for Dolby (including an MPX switch), record level and balance, variable bias and headphone monitoring level. The meters, which are a visual treat, have a 33dB range. The only remaining facility is one in which play mode can be preselected during rewind for auto-play from the tape start.

LAB REPORT

Akai has made a neat, professional job of this recorder. The PC board is a joy to behold, and internal layout is about as uncluttered as they come, with adequate screening of the display electronics. The mains transformer is carefully oriented and positioned well away from any of the audio circuitry to reduce undesirable interactions.

The transport itself is a two-motor design with dual capstans, a closed loop drive and a better than average tape guidance system to help ensure an accurately defined tape path across the heads. Slack in the tape is taken up automatically on insertion. The heads are of Akai's proprietary Super GX construction with LC-OFC windings.

The frequency responses are all rather poor, each being tilted heavily into the treble at a rate of between approximately 0.5 and 1dB/octave, which not unexpectedly has

audible consequences. The LF response shape is also rather peculiar, defying ready analysis, though it is probably related in some way to Akai's head construction. The replay response shape however is quite good.

The Akai is also a disappointment elsewhere. Although there are reasonable levels of headroom above the 0dB (OVU on the meters), signal/noise figures are below average, and the Type II noise Figure of Merit is the lowest in the test group, which is indicative of the general problem. Pitch integrity is also below the standards expected of a deck in this price area, the wow component being especially poor. This said, it's worth bearing in mind that the test sample (a 220v European model) may prove unrepresentative of production models.

SOUND QUALITY

Irrespective of the type of tape used, the bass had a lightweight, rather boxy feel which flavoured all the results to some extent. Even flavouring the bass to one side, I was never able to achieve a response shape that sounded particularly flat, or a midband with the sharpness and focus that ought to have been there. Tina Turner's *Look Me In The Heart* was reproduced with an edgy vocal quality and a sluggish, recessed rhythm section – and this with metal tapes, which after rebiasing made more lively sounding recordings than either of the other two tape groups.

Much the same thinness and lack of presence was apparent in Nancy Griffith's beautifully recorded *Spin On A Red Brick Floor* (from the *One Fair Summer Evening* album). The fleet fingerwork of one piano recording the GX-65 was asked to copy (from the opening of Debussy's *Children's Corner Suite* played by Nikita Magaloff on Denon CD) lost any sense of concentration and energy, merely sounding competent but lazy when monitored off tape. The subsequent *Golliwog's Cake Walk* from the same piece lacked dynamics and had uncertain pitch.

Even leaving these points to one side, the GX-65 additionally proved intermittently drop-out prone, particularly surprisingly given its dual capstan transport, which can normally be relied upon to pull all but the most problematical tapes out flat whilst they're being played. My test prerecorded tapes were obviously bright and transient

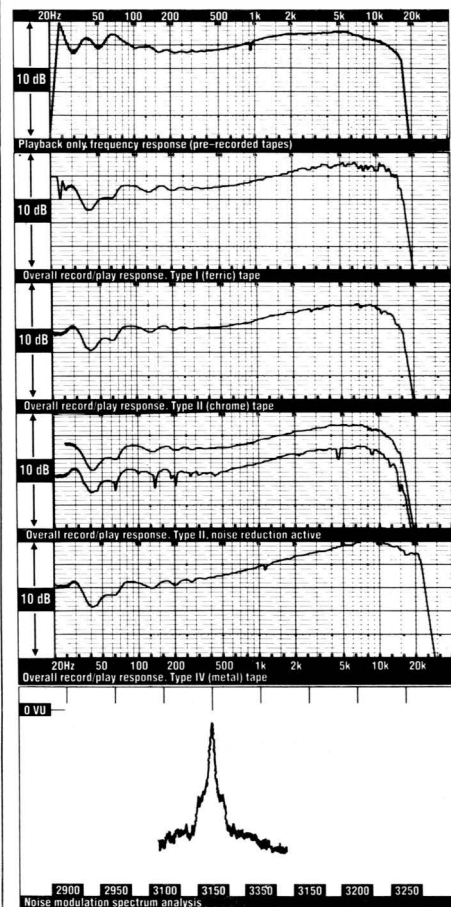
led, but otherwise not too bad.

CONCLUSIONS

It is not impossible that some of the setting up limitations on the deck as received may prove atypical of production when it gets under way. But the marginal transport and thin, uneven bass damn it even if there is an excuse for the other failings. This deck doesn't meet present day standards, despite having all the right attributes on paper, not the least of which is a bolt-on remote control handset and a high standard of presentation.

TEST RESULTS

Dolby Level reading on deck's meters	—1dB
Rec/replay response —3dB ref 1kHz	
IEC Type I	<20Hz —16kHz
IEC Type II	<20Hz —17kHz
IEC Type IV	<20Hz —22kHz
Wow & Flutter — Peak DIN wtd/unweighted	0.17%/0.22%
Wow/Flutter — Peak DIN wtd	0.14%/0.16%
Speed error	+0.8%
Type I signal/noise CCIR/ARM 400Hz & distortion OVU	45dB
Type II signal/noise CCIR/ARM 400Hz & distortion OVU	51dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	52dB
Noise Figure of Merit (Dolby level/noise Type II)	1.1%
Crosstalk + Noise ref OVU/1kHz	50dB
Line input sensitivity/overload	39dB
Mic input sensitivity/overload	112mV/>13V
Line output for 0dB/maximum	n/a
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	632mV/3.8V
Azimuth check R-L phase at 10kHz	0.45%
VU indication at IEC 0dB	10°
Dimensions (w x h x d)	0dB
Average wind/rewind time (C90)	42.5 x 13.3 x 34cms
Typical retail price inc VAT	1min 46secs/fast £299



DENON DRM-400

HAYDEN LABS LTD., HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST. PETER, BUCKS SL9 9EW. TEL: (0753) 888447.



This brand new, budget priced addition to the 100 series is a direct replacement for the well liked but long in the tooth *DR-M07*, Denon's entry level model until now.

The deck is well endowed in most respects, though the five step 16dB meters are strictly in the beer budget class, and the numerical decibel meter scale is too dark to be readily visible in most lighting conditions. Noise reduction is by Dolby C as well as Dolby B, and Denon provides a defeat switch for the MPX filter.

The control system is centred on a fully logic buffered set of command keys spread in a long row beneath the meter display, and despite some untidy graphics, control ergonomics are first class. The transport extends beyond the basics to include track search which will cue the start of the track currently being played, or the next track along. There's also a memory stop feature, which intriguingly works quite independently of the mechanical tape counter. The transport is stopped at the point the memory stop button was activated, irrespective of the counter reading at the time. In effect this means that two points along a tape can be indexed.

Tape type sensing is automatic, and is assisted by a fine bias adjustment pot for ferric and chrome bias tape only (Type I and II). The metal bias position is fixed. There is also a headphone socket. Other features include LED telltales for memory stop, Dolby B/C and MPX filter status, and the cassette cover is readily removable for cleaning.

On the minus side, I was disappointed to find that the 400 has no support for timers, and therefore cannot be used for absentee recordings, an omission also shared with other recent Denons. But for a touch of bolt-on class, the glossy brochure lists wood side cheeks as options.

The *DRM-400* perpetuates a near inexcusable design failing also found, for example, in the *DRM-700*: the Dolby switching status is lost when the unit is switched off. Default is to Dolby off, and if the deck is used with Dolby B or C, you must select the circuit each time it is switched on.

LAB REPORT

The innards show attention to detail beyond the norm at this price level. The board layout looks highly serviceable, the transformer is

carefully screened, and the transport is a two-motor affair of simple build. All of the main structure apart from the top surface, which is constructed as a shallow tray, is a ribbed plastic moulding, reducing magnetic coupling effects.

The least impressive feature of this deck is the transport, which gives high levels of wow and flutter, especially flutter (note the blunting of the central peak in the spectrum analysis). The transport also suffers a very slow fast wind speed, which is thoroughly undesirable because it is known to encourage bad language. It certainly did so on test. Noise levels are generally a little worse than average largely due to limited headroom, distortion building up rapidly near 0VU. The Type II 'Figure of Merit' is second worst only to the Akai *GX-65*.

There are no such problems elsewhere. In particular, the various frequency responses are all well aligned for tape formulations that fit the standard IEC curves, especially with Type I and IV tapes. Prerecorded tapes are also accurately reproduced, barring an innocuous lift in the extreme treble.

SOUND QUALITY

Sound quality was, in a word, poor. Starting with prerecorded material, the 400 had a dulled, restrained upper treble quite at odds with the measured response trend. The lift and 'air' that play such an important part in recordings like Suzanne Vega's first album, one of the recordings used for the playback tests, were entirely missing. All I heard was congestion and smear.

The modest 40 degree azimuth phase error (at 8kHz) was insufficient to explain the shortcomings I identified. This left the excessive measured flutter levels as the only plausible explanation, and one that gained credence when recordings were made which showed identical shortcomings. Rebiasing did nothing to help; indeed the standard ferric responses achieved with the bias control set to its centre detent gave a very slight reduction in midband level compared to the treble. Metal tapes were the same, which should add to the recorder's incisiveness.

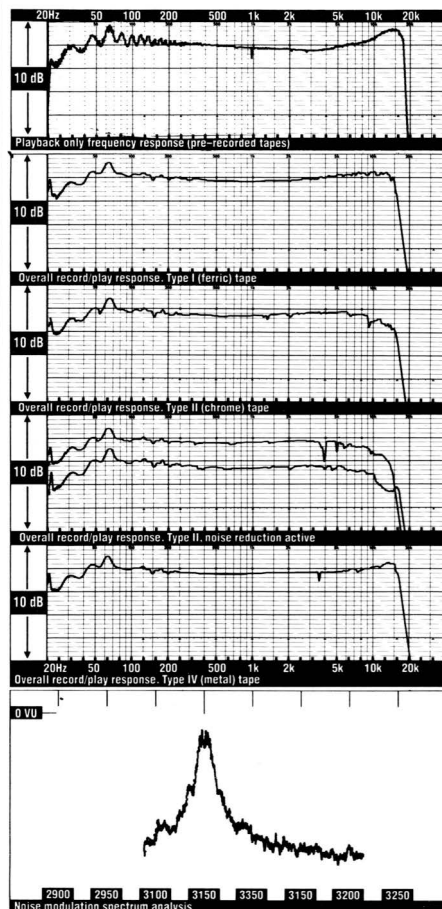
For what it's worth, pitch stability seemed pretty fair, though some rapid wow artefacts were occasionally noted with music featuring steady sustained notes or repeated patterns.

CONCLUSIONS

Denon needs to work on this model, which as it stands is far from competitive and hardly an acceptable replacement for the lamented *DR-M07*. The loss of clarity, stereo imagery, spaciousness and other qualities contingent on good mechanical behaviour are not acceptable. The Dolby switching design fault should also be tackled as a matter of priority.

TEST RESULTS

Dolby Level reading on deck's meters	-5dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	<20Hz -16kHz
IEC Type II	<20Hz -16kHz
IEC Type IV	<20Hz -17kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.10%/0.25%
Wow/Flutter - Peak DIN wtd	0.05%/0.25%
Speed error	+0.4%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	50.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	56.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	57.5dB
Noise Figure of Merit (Dolby level/noise Type II)	3.3%
Crosstalk + Noise ref 0VU/1kHz	51.5dB
Line input sensitivity/overload	45.5dB
Mic input sensitivity/overload	97mV/>13V
Line output for 0dB/maximum	n/a
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	884mV/2.85V
Azimuth check R-L phase at 10kHz	0.4%
VU indication at IEC 0dB	40°
Dimensions (w x h x d)	0dB
Average wind/rewind time (C90)	43.3 x 12.4 x 26.5cm
Typical retail price inc VAT	2min 42secs/very slow
	£130



DENON DRM-700

HAYDEN LABS LTD., HAYDEN HOUSE, CHILTERN HILL, CHALFONT ST. PETER, BUCKS SL9 9EW. TEL: (0753) 888447.

RECOMMENDED



The *DRM-700* is one of the more ambitious Denon models, its key selling feature being separate record and playback heads for near-instantaneous monitoring of recordings in progress. This is combined with a transport mechanism of some sophistication, though Denon stops short of a no-hold's barred dual capstan drive because the budget won't stretch quite that far.

What the *700* does have is a clean, uncluttered, even classy exterior, with well designed controls and a 50dB operating range display (from -40dB to +10dB) with peak hold LED telltales and resolution of 1dB near 0VU. In addition to Dolby B and an MPX filter, the Denon is one of the now overwhelming majority of decks with Dolby HX Pro. Bias levels can be tweaked in the usual way with all three tape groups.

Tape search aids however, are thin on the ground. The counter is electronic and reads in real time - there's no rolling display option in this case - and it can trigger a memory stop device at the counter 00:00 reading. Record return completes the trick play options. Finally, the Denon has an output level control which for some reason is plumbed into the main output line as well as the headphone circuit, which represents an undesirable and wholly unnecessary compromise.

One stupid design point is that the Dolby switching is entirely in software, and the setting is lost when the recorder is switched off. Unless you don't use Dolby, you'll have to select it every time the unit is turned on. The Denon's display area however is excellent - informative, well laid out and exceptionally clear; it really adds to the feeling of being in control.

LAB REPORT

There's nothing extravagant about the way this deck has been built. A steel sheet running fore and aft just to the right hand side of the transport adds some stiffness to a rather wobbly mainly plastic carcass, and also provides a dash of electromagnetic screening into the bargain. The power transformer appears to be adequately specified, and the transport has a single capstan but three motors, providing a (claimed) low cogging, constant torque reel drive - and superbly quiet cam operated mode engagement.

Shock absorbing feet are fitted, but they appear to have been designed more for show than function.

The figures for pitch stability are remarkably (and surely not coincidentally) similar to those for the *DRM-400* which means we're dealing with an extremely fine transport. The fine, narrow spectrum plot peak confirms this finding. The downside is also the same as with the cheaper model - interminably slow wind speeds. You can fall asleep waiting for the deck to trundle from one end of the tape to the other.

The record/replay responses - and this includes the replay only response - are a little dished, with a broad depression around 1kHz, which can be expected to lead to a slightly distant sound, perhaps lacking in presence. But rebiasing helps, and is easily accomplished with this (as with any other) three-head recorder.

SOUND QUALITY

The Denon has a wider operating dynamic range than the majority of its peers. Even with ferric tapes, it was capable of recording the forceful drum blows at the start of the *Das Irae* from Verdi's *Requiem* (Telarc) up to +8dB or more with no significant compression or distortion. The *700* was also quite un-fazed by complex, high level, high frequency sounds (eg the brass and choral fanfare that follows in the same piece), a quality almost as apparent with ferrics as with chromes or metals.

One reason for the deck's good showing on audition was the remarkably well optimised Dolby installation. The Dolby C circuit was almost free of the HF 'fizz' that plagues so many installations, and there was no trace of the breathing behind transients that also subtly remodels low level passages with many decks. This and a first class transport provided an unusual sense of clarity, with excellent transient attack (tested with piano) and an unusual consistency under all conditions of use. The deck was perceptibly more focused and in control than most.

Prerecorded test tapes however, reproduced with a curiously monochromatic, almost wooden quality. With one example (a track from Suzanne Vega's first album) the vocals and percussion lacked air, yet the almost understated quality made good musical

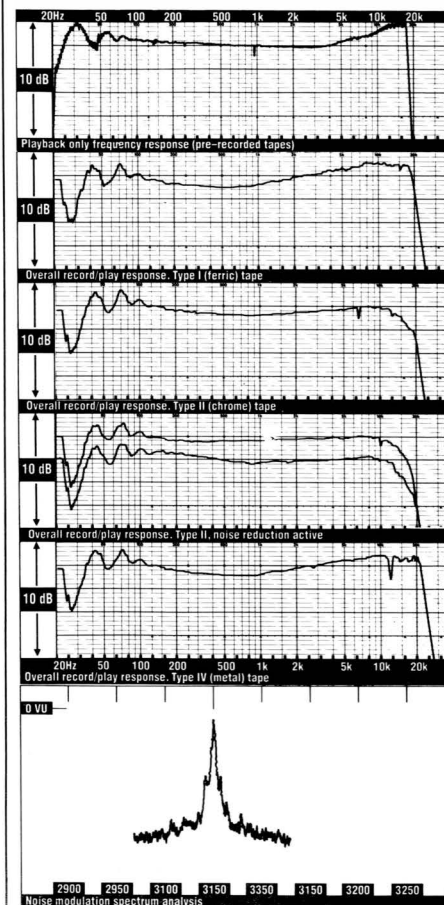
sense, and little detail was lost.

CONCLUSIONS

This deck represents exceptional musical value, despite a veritable list of petty annoyances such as slow fast wind speeds (if that isn't a contradiction in terms), the non-latching Dolby switching, lack of timer standby and so on. Recommended then, but so nearly a Best Buy...

TEST RESULTS

Dolby Level reading on deck's meters	0dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	30Hz - 21kHz
IEC Type II	30Hz - 21kHz
IEC Type IV	30Hz - 22kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.10%/0.20%
Wow/Flutter - Peak DIN wtd	0.07%/0.15%
Speed error	+0.2%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	48.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	53.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	55.5dB
Noise Figure of Merit (Dolby level/noise Type II)	53.5dB
Crosstalk + Noise ref 0VU/1kHz	43.5dB
Line input sensitivity/overload	93mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	700mV/2.4V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.0%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	1dB
Dimensions (w x h x d)	43.4 x 13.4 x 29.2cms
Average wind/rewind time (C90)	2min 29secs/slow
Typical retail price inc VAT	£240



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RECOMMENDED



This imposing design is Kenwood's new entry level three-head cassette deck, which will set you back £260. In functional terms it is a conventional enough deck, but on closer examination it subtly betrays its Kenwood origin.

The slightly rattly sounding transport (in anything but standard play or record modes) is controlled by a logically disposed bank of keys just below the display area. The latter is home to large and clear high resolution two colour record level meters, with peak hold. Their operating range is from -30dB to +10dB. Adjacent to the transport is a real time electronic memory tape counter. Tape/source monitoring is automatic with manual override, and signal processing circuits include the usual Dolby triumvirate including HX Pro, and MPX filter switch. A volume control feeds the headphone socket.

One of the machine's more interesting selling features is an auto-bias circuit, which at the touch of a button takes about 16 seconds to automatically optimise record bias. The settings can't be stored, and are lost when the tape's removed.

Pore through the instruction booklet and you'll discover hidden extras. They include record return, full side auto repeat and auto play following rewind. The best extra however, is the infra red remote control.

An important feature of the 4520 is that it is designed to co-exist with other, suitably equipped components or systems. A key labelled CCRS can be used with suitably equipped CD players in a special set-up mode to reduce the number of manual operations when adjusting record levels.

LAB REPORT

It is a well-built player both inside and out, with shock absorbing feet fitted to the base and a power supply that appears to have a reasonable capacity. Considerable care has been taken to screen RF signals from the rest of the audio circuitry; Kenwood being one of the few makers in this group to screen the display electronics properly. All in all, a well-built player without too many obvious shortcuts, and what appears to be a highly serviceable one to boot. The transport boasts dual capstans and two motors, and automatically takes up tape slack. The record bias oscillator chunters along at over 200kHz, a much

higher frequency than is usually the case.

At the standard bias settings, only the Type IV plot was substantially in error, with an HF loss of just 2dB at 20kHz, which isn't the end of the world. Using the auto-bias circuit led to the extremely accurate responses shown, with deviations restricted to ± 0.4 dB from 100Hz to 15kHz or beyond with all tape types. The Dolby circuits are well adjusted, but the playback response shape is significantly in error, leading to the dished response shown. Wow and flutter levels are low, though some discrete wow sidebands are visible in the plot. Signal/noise is moderate, but aided in practice by good headroom. Forward and reverse wind speeds are rapid.

SOUND QUALITY

The dished playback response shape gave an effect akin to a mild 'loudness' contour: a slightly excessive but surprisingly sharp and articulate bass and treble, brilliant, even glaring tonal colours (the Sony *Trinitron* syndrome?), but there was also plenty of detail, space and life.

Some previous Kenwood decks have left me slightly cold, offering a style of musical delivery that seemed admirable but not especially likeable. However, there has been a perceptible trend towards higher, more purist performance standards and this deck conspires to set a high standard all round. There was still a trace of an electronic edge to the sound, although this was only occasionally apparent.

With the added brilliance toned down, courtesy of the ruler flat frequency responses, the deck sounded excellent. It had almost natural tonal colours, a fine sense of detail, real consistency between tape groups (metals had the edge, though oddly they could sound a little metallic) and fine, sure-footed bass.

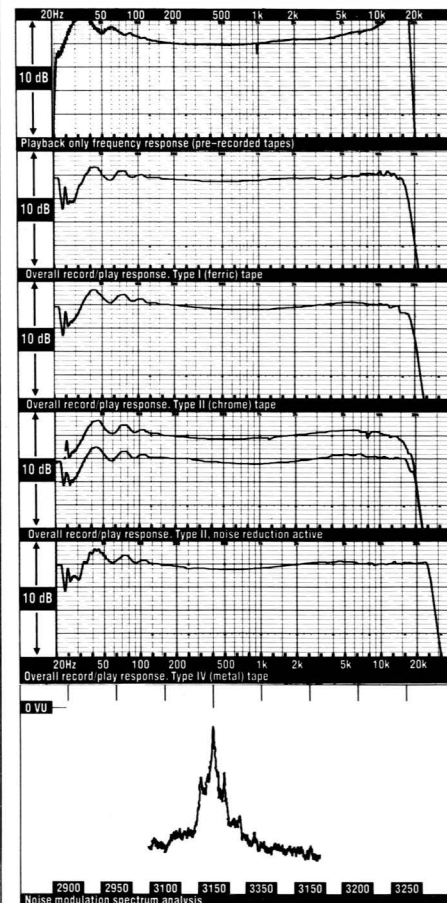
The only negative comment concerned Dolby alignment. With quiet, correctly biased tapes, the Kenwood was consistently more noisy than usual in the operating area of the anti-saturation network (near the upper hearing limit), with clear signs of increasing noise present behind the higher frequency strands of music. This effect was only really noticeable when monitoring on headphones, but it suggested an imperfectly integrated Dolby circuit.

CONCLUSIONS

There are some oddities with this deck – for example it has some useful minor transport features that rely on obscure control sequences that are easily forgotten, and a Dolby circuit which provides some slightly odd results at HF, though the problems are only noticeable with headphones. Technical performance is good enough despite this, but it does not explain the overall standards of music making, which are scarcely short of exemplary given the price.

TEST RESULTS

Dolby Level reading on deck's meters	+1dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	<20Hz - 18kHz
IEC Type II	<20Hz - 20kHz
IEC Type IV	<20Hz - 23kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.10%/0.20%
Wow/Flutter - Peak DIN wtd	0.06%/0.18%
Speed error	+0.2%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	47dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	52.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	54dB
Noise Figure of Merit (Dolby level/noise Type II)	53.5dB
Crosstalk + Noise ref 0VU/1kHz	46dB
Line input sensitivity/overload	100mV/>13V
Mic input sensitivity/overload	n/A
Line output for 0dB/maximum	789mV/4.4V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	12%
Azimuth check R-L phase at 10kHz	50°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	44 x 12.8 x 31cms
Average wind/rewind time (C90)	1min 45sec/fast
Typical retail price inc VAT	£260



AKG
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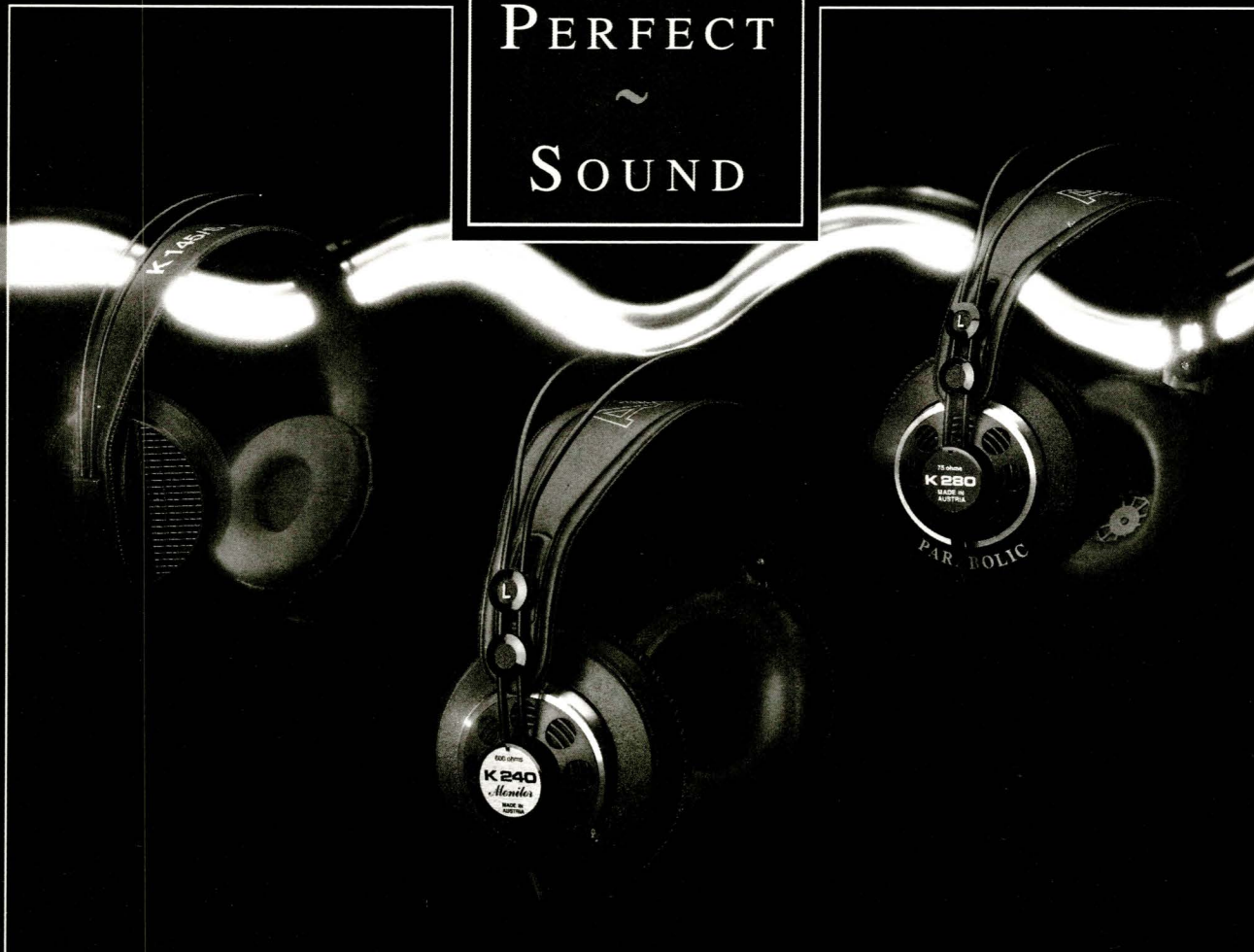
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MARANTZ SD-40

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



Marantz has a whole range of new components featuring the rather strong styling you see illustrated here. Technically, the *SD-40* breaks little new ground, but it's a thorough piece of work nonetheless.

The specification list includes many of the expected highlights, including Dolby B and C with MPX filter switching, Dolby HX Pro, fine bias adjust (for Type I and II tapes only), a fixed level headphone outlet and a simple mechanical tape counter. The *SD-40* owner doesn't suffer a surfeit of search aids, but there is a record return feature which works by hitting 'rewind' when in record mode.

The ergonomics are not wholly successful. On the plus side, the *SD-40* boasts well differentiated controls which are grouped according to function, but many are quite small, and the status telltales that do exist are easily overlooked and too remote from the controls that drive them. Some of the design decisions defy logic, one example being the transport control cluster which has the fast wind keys flanking a larger pause key, a position better occupied by either the stop or the play key. I was also mildly disappointed that the record level display was so short, though in recompense it is otherwise well specified, and thankfully includes illuminated scaling to match the level read-out LEDs.

The transport is fully logic buffered, and operates sweetly whilst protecting the tape against misuse. The look of the beast also has its strengths. Merely to be different in the company of hackneyed clones isn't to be sniffed at – it almost seems that it's the fate of most hi-fi equipment to be thoroughly stereotyped.

LAB REPORT

Structurally the front panel is a little ramshackle and probably doesn't provide an ideal level of support for the transport, although the deep side panels make the basic tray structure less wobbly than some. Component standards appear to be a little better than average at this price level, an example being the Elna audio grade capacitors at critical points. Despite the Philips connection though, it is Sony which supplies the Dolby IC. The power supply is better endowed than usual, and the transport has separate capstan and reel drive motors, and a decent looking capstan flywheel.

The measurements give no strong indication of what to expect on audition as most of the test results are satisfactory in a strictly unexceptional kind of way. A mild equalisation error results in slightly tilted record/replay responses favouring the treble, but bass behaviour is good in each case, and the metal response shape is also good. The replay only frequency response is sound. Transport performance is not amongst the *SD-40*'s strengths, both wow and flutter being unexpectedly poor. There are also indications that the integrity of the tape contact with the head is erratic, leading to some treble unevenness and drop-out. Wind speed, finally, is about average.

SOUND QUALITY

For the most part, sound quality was distinctly underwhelming. Playing commercially recorded tapes for example, the Marantz had a muffled midband and a thin, rather untuneful bass. It also suffered from the effects of Dolby mistracking, which made itself apparent in one particularly badly affected female vocal recording (a track from Suzanne Vega's first album) as quite severe modulation of the level, dynamics and frequency balance of the backing instruments.

This is a particularly insidious type of distortion which far more than most problems – noise for example – makes listening a peculiarly uncomfortable experience, the psycho-acoustic reason being that the ear/brain notices change most, and the constantly changing nature of Dolby mistracking draws attention to itself. The brain is quite adept at filtering out steady sounds like hiss.

The poor showing with prerecorded material set the tone for the recorder as a whole. Even before making any test recordings, it was clear that the Marantz's electronics had a rather rough sound, and one moreover which sounded shallow in the bass and lacking in tangibility. This is the classic cheap amplifier syndrome. All cassette decks contain amplifier-like circuit blocks of course. The *SD-40* recording section (the heads and so on) turned out to be rather good with all types of tape – it worked very well with metals which overwhelm some budget recorders – but the rather grubby electronics remained in circuit, and to an extent dominated the sound. As expected then, the thin-

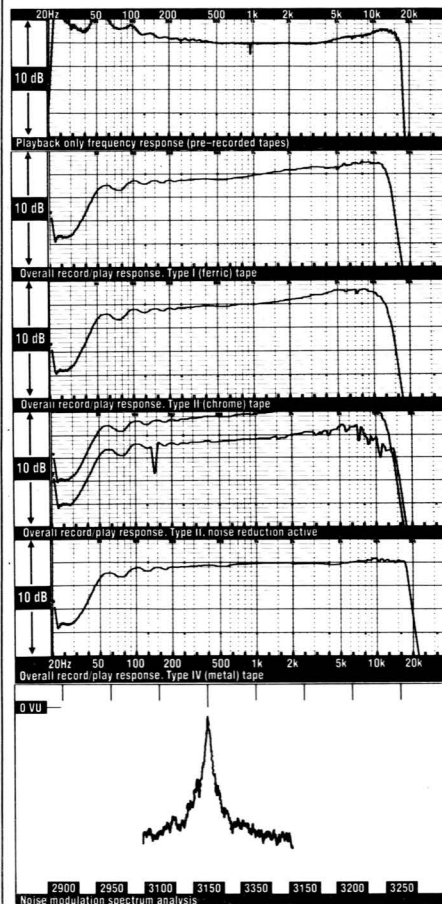
ness and lack of presence identified in the electronics was superimposed on to the recordings made, which had what might be described as a hand's off quality.

CONCLUSIONS

No timer standby is the only potentially important missing feature in a deck that records both well and for the most part, accurately, but which nevertheless tends to sound somewhat synthetic. It is worth considering, but is not a firm recommendation.

TEST RESULTS

Dolby Level reading on deck's meters	-2dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	40Hz - 14kHz
IEC Type II	40Hz - 15kHz
IEC Type IV	40Hz - 19kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.19%/0.24%
Wow/Flutter - Peak DIN wtd	0.13%/0.22%
Speed error	+0.6%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	52dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	2.7%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	58dB
Noise Figure of Merit (Dolby level/noise Type II)	1.8%
Crosstalk + Noise ref 0VU/1kHz	58.5dB
Line input sensitivity/overload	2.6%
Mic input sensitivity/overload	56dB
Line output for 0dB/maximum	48dB
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	70mV/>13V
Azimuth check R-L phase at 10kHz	n/a
VU indication at IEC 0dB	591mV/3.9V
Dimensions (w x h x d)	42 x 13.5 x 28.5cms
Average wind/rewind time (C90)	1min 56secs/average
Typical retail price inc VAT	£170



MARANTZ SD-50

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



The *SD-50* is a standard unidirectional two-head recorder, but of its type it's extremely well equipped. The family resemblance to the *SD-40* (reviewed separately) is clear enough, but there's an even stronger apparent link with the three head *SD-60* which this one closely resembles in operating terms, though the transport isn't of *SD-60*-style sophistication. As you can see it is also strongly styled, though the plethora of similar looking control buttons strung out in a row just below the main display detracts from ease of use to a degree. This apart, the control system and associated telltales are a considerable improvement on the *SD-40*.

The signal processing circuits offer the usual range of options, including Dolby B and C (mit a filter defeat key which should be used whenever possible – meaning all the time unless you're blessed with an FM tuner with a 'dirty' poorly filtered output), Dolby HX Pro (of course) and a fine bias adjust knob which operates with Type I and II tapes, but has no effect with Type IVs. The record level meters are rather short, but have illuminated scaling figures and fine resolution, as well as a satisfyingly wide operating range extending from -35dB to $+12\text{dB}$ ref 0VU. It's just a shame they aren't a little more generously laid out.

Peak levels above 0VU are also spelt out eg $+8\text{dB}$ in an alpha-numeric read-out adjacent to the record level meters, which sounds like overkill, and which on consideration probably is. At other times, this same display shows operating status, eg REC, STOP, PLAY and so on. The *SD-50* will not accept microphones directly, but there's a volume control controlling the headphone circuit, and the deck can be used with an outboard timer for unattended use.

The *SD-50* reveals itself as being particularly good when asked to find its way around a tape. The tape counter (which has real time or rolling number display options) can be used for memory stop purposes. Tracks numbered up to 15 away from the present position in either direction can be located directly, with the deck's display confirming the instructions you've set. In addition, the deck has intro-search and record return, the latter positioning the tape at the start of a recording for rerecording or playback purposes. A device called blank skip

enables unrecorded passages of tape to be located. It's even possible to repeat individual tracks if you're so minded.

LAB REPORT

Technical performance is strong. Note the excellent fast forward/rewind times, and the very acceptable level of pitch stability offered by the transport, the spectrum analysis being essentially clean of dominant effects to disturb the listening.

The raw signal/noise figures look good, but must be viewed in the light of quite high distortion figures, which show that the 0VU point on the meters is recorded fairly high up the tape saturation curve, a feature this deck shares with the other Marantz models tested as well as the Philips. The signal/noise Figure of Merit, which is designed to overcome such inconsistencies, is a strictly average 56.5dB measured with Type II tape.

SOUND QUALITY

For a $\pounds 220$ cassette deck, the *SD-50* is first rate. Just to rub home that it is not to be compared to the *SD-40*, despite the similar appearance, the *SD-50* was much more authoritative and solid sounding when playing back prerecorded tapes. The bass, though just perceptibly light in balance, had none of the *CD-40*'s thinness.

When properly handled it was an effective advocate of the extra dynamic slam available from metal tapes, and on a number of test recordings, the *SD-50* was always lively and engaging, with the aforementioned solidity reflected in well focused stereo imagery. Type I and II tapes tended to sound marginally softer, but retained most of the precision and lack of waffle characteristic of metals. What softness there was all but disappeared with the best high grade Type IIs however, and tapes like TDK *SA-X* made some fine naturally effervescent recordings. Dolby HX Pro ensures good performance even with ferric tapes, but the lack of absolute pitch integrity was occasionally audible.

Whilst prerecorded tapes sounded tonally neutral (or just very slightly bright), to achieve comparable results with blank tapes almost always means readjusting record bias, unless you prefer tapes with plenty of 'top', which can be useful with recordings made for car players. Bias tweaking is a painstaking

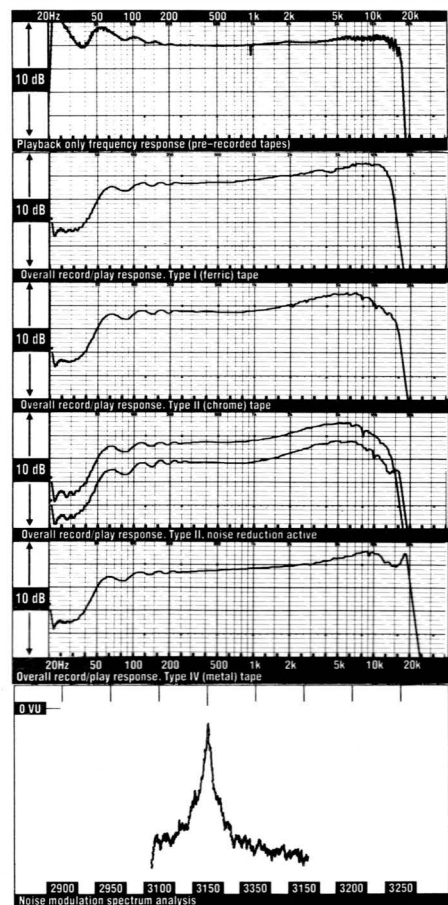
trial and error task much more readily accomplished with a three-head recorder, which needn't cost much more than this model.

CONCLUSIONS

Firmly Recommended, this is a consistently good all-rounder irrespective of the tape group used, though inevitably the better, more expensive tapes can and usually do pay for themselves. The *SD-50* is also an excellent deck for playing prerecorded musicassettes.

TEST RESULTS

Dolby Level reading on deck's meters	-1dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	42Hz - 15kHz
IEC Type II	42Hz - 16kHz
IEC Type IV	42Hz - 16kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.13%/0.20%
Wow/Flutter - Peak DIN wtd	0.08%/0.19%
Speed error	+0.3%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	51.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	57.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	2.1dB
Noise Figure of Merit (Dolby level/noise Type II)	56.5dB
Crosstalk + Noise ref 0VU/1kHz	48.5dB
Line input sensitivity/overload	72mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	519mV/3.6V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.8%
Azimuth check R-L phase at 10kHz	15°
VU indication at IEC 0dB	2dB
Dimensions (w x h x d)	42 x 13.6 x 28.8cm
Average wind/rewind time (C90)	1min 54secs/fast
Typical retail price inc VAT	£220



MARANTZ SD-60

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

RECOMMENDED



The Marantz *SD-60* is a relatively affordable example of a three-head cassette deck. Even leaving the third head to one side, the Marantz is impressively specified. As well as the standard features – Dolby C, HX Pro, full logic controls and the like – you get adjustable bias for ferric and chrome type tapes and a record level (sensitivity) calibration control. The HX Pro circuit, which of course operates during the record cycle only, is switchable, though theory suggests that this should never be necessary since HX Pro is a single ended process, meaning that the benefits it provides are available irrespective of the playback machine. I have only encountered this feature on a couple of occasions, and heard a significant difference with HX Pro in and out of circuit. This time, although I thought I heard differences at the point of switchover, I was unable to reliably identify the 'in' and 'out' conditions.

Other features are headphones connected through a volume control, and a wide range of broadly *SD-50*-flavoured tape search options. These start with the tape counter, an electronic device capable of displaying rolling numbers or time, each individually resettable. A memory stop feature is available, and so are intro search, track search (the circuit will find up to 15 tracks in either direction), blank skip and record return. This ought to be enough for anyone, but in addition there are wide ranging (47dB) if cramped record level meters with an alphanumeric display attached which shows overload levels in decibels, or alternatively the name of the selected transport functions or record status, as appropriate.

After due consideration however, although I appreciate the fact that the Marantz looks different, I also feel it looks contrived. With its cramped, wordily labelled and ungenerously designed controls, the *SD-60* probably isn't the best retirement gift for the granny with the dickey peepers.

LAB REPORT

The cassette slots into a well designed door incorporating a cassette clamp and is driven by a sophisticated two-motor, dual capstan transport with a diecast chassis, headblock and other fixed components instead of using simple pressings and bolt on additions that inevitably introduce unwanted compliances.

Dual capstans confer immunity at the tape head to influences on the tape outside the loop defined by the capstans, which, being slightly different in size, also determine tape tension across the heads. Shaping of the permalloy PC-OCC wired heads avoids sharp contour effects.

The tape head replay amp is a direct coupled differential design using FETs, and great care has gone into the record amp, which is a low current drive equalisation amp where a resistive buffer would normally be used. Separate power supplies are used for the audio and the transport/logic sections.

Despite the rather average looking wow and flutter figures, there are no dominant modes of misbehaviour, and the spectrum analysis is extremely clean in appearance. Bass output is well extended with relatively limited ringing, but it's hard to ignore the overall tilt in most of the response plots (Type I excepted), or the less than perfect state of line-up of the Dolby C circuit. The replay trace is also rather odd, with a clearly boosted extreme treble. The deck is otherwise good. It's electrically quiet, offers adequate headroom for all tape groups, and tops it all with a rapid fast wind facility.

SOUND QUALITY

Although Type I and II's measurements were bright with the unreconstructed bias settings, what I heard was what can only be described as a collapse in spatial attributes – depth especially – and a clear reduction in top end dynamics and energy. These things clearly outweighed the mild tonal imbalance, and changing the type of music made little difference.

However, metal tapes worked wonderfully in this deck. The standard of music making was rich, vibrant and very solid, with good output stability which was not clearly pre-pegged in the test results. This deck is plainly designed with the particular qualities of metal tapes very much in mind, and only really came to life when using them.

Dolby B noise reduction worked well in this deck, and will do so even with oddball tapes given the ability to adjust sensitivity as well as bias. This said, Dolby C recordings sounded very slightly worse. Transients sounded heavier and the deck less sure-footed. On the other hand, the *SD-60* proved

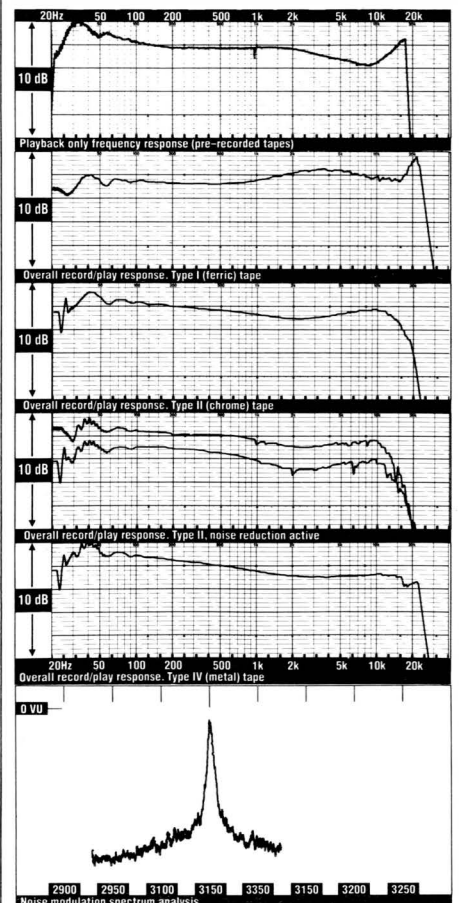
to be a pleasant and capable tool with pre-recorded material.

CONCLUSIONS

Recommended, providing metal tapes are used for serious high-grade work. The difference between metal and non-metal performance standards is a little disconcerting, but is more than partly attributable to its ability to get the best from the latter rather than any undue facility for making a meal of the former.

TEST RESULTS

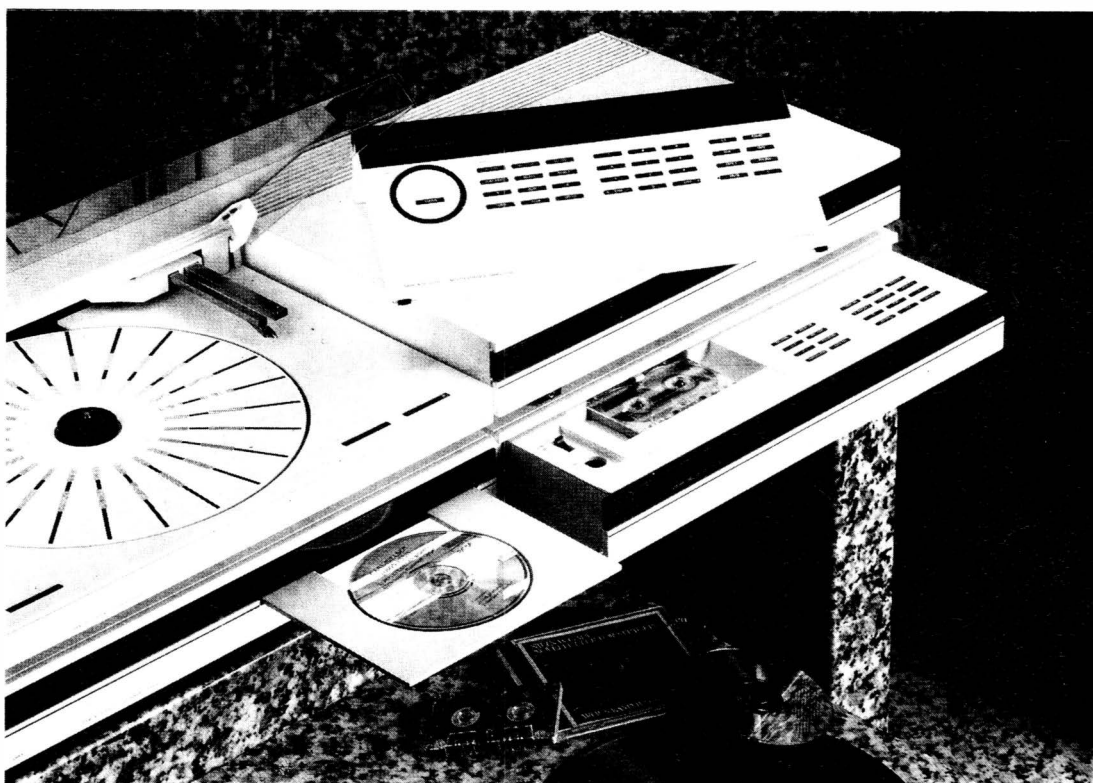
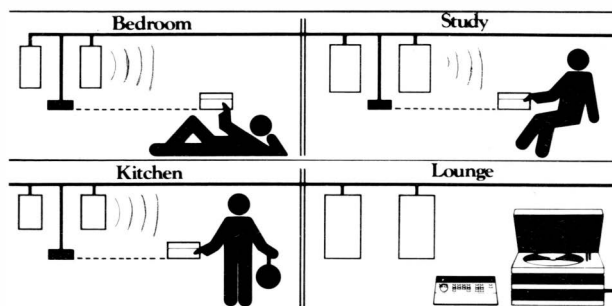
Dolby Level reading on deck's meters	— 1dB
Rec/replay response — 3dB ref 1kHz	
IEC Type I	<20Hz – 23kHz
IEC Type II	<20Hz – 20kHz
IEC Type IV	<20Hz – 22kHz
Wow & Flutter – Peak DIN wtd/unweighted	0.14%/0.17%
Wow/Flutter – Peak DIN wtd	0.11%/0.14%
Speed error	+0.4%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	52dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	59dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	59dB
Noise Figure of Merit (Dolby level/noise Type II)	1.5%
Crosstalk + Noise ref 0VU/1kHz	58dB
Line input sensitivity/overload	56dB
Mic input sensitivity/overload	77mV/>13V
Line output for 0dB/maximum	n/a
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	627mV/3.85V
Azimuth check R-L phase at 10kHz	1.25%
VU indication at IEC 0dB	40°
Dimensions (w x h x d)	0dB
Average wind/rewind time (C90)	42 x 15 x 34.5cms
Typical retail price inc VAT	1min 52secs/fast £350



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Although the disposition of controls is quite different, this Japanese made Philips model is closely related to the three Marantz models covered in this issue, though it's much more conservatively packaged. The most attractive feature without doubt is its £250 asking price. Even for a very basically equipped three-head recorder £250 represents good enough value for money, but this is far from being basically equipped, and the pricing looks very sharp.

The use of three instead of the usual two heads means that the record and playback functions are not compromised by the use of a combination record/playback head that by definition can't perform either task optimally. Three heads also means that you can be certain a recording is working the way you expect by monitoring it from tape in real time.

The supporting list of features is extensive and impressive. As well as the usual Dolby noise reduction circuits, the Philips has Dolby HX Pro headroom extension, a headphone level control and fine adjustment of record bias to help fit tape to machine, as long as the tapes are not metal/Type IV that is. The LED tape counter is a dual mode type with rolling numbers or time data readouts, and it has a memory stop feature too.

Track search (which ranges over 15 tracks in either direction) and programming (of up to 15 tracks) combine with intro search (AMS) and blank skip to produce a powerful suite of tape 'look up' aids. An alpha-numeric display supplements the wide ranging (47dB) but cramped record level meters with appropriate status information or a peak level read-out. The 870 is also remarkably quiet in the way it engages transport functions.

LAB REPORT

It's nice to know that whilst Philips sells Dolby ICs to other manufacturers, it buys the ones for its own cassette decks from Sony. This presumably relates to the Marantz link, as Marantz also uses Sony. The recorder has what appears to be a fairly simple internal layout but a well specified circuit, with a decent power supply, good quality audio capacitors and a standard off the shelf Marantz transport.

In technical terms, the deck suffers from

the inevitable comparison with the £30 cheaper two-head but otherwise remarkably similarly specified Marantz *SD-50*. The price you pay for three heads can be seen in the behaviour of the transport, which gives wow and flutter figures in character with those of the Marantz except that they are consistently about 50 per cent higher (ie worse). The record/replay frequency responses other than the ferric/Type I position are also somewhat awry, and in the Type IV/metal setting bias is of course fixed. Adjusting the bias level was enough to flatten the Type II curve, but metals can only be regarded as marginally compatible with the recorder as it stands.

This said, the Philips offers wide dynamic range figures in some situations, though the Type II Figure of Merit is identical to the *SD-50*, suggesting that the edge enjoyed by the Philips comes from superior headroom in the electronics. The Philips also offers rather wider frequency responses at both ends of the audio spectrum, which in the case of the treble is attributable to the separate record and playback heads.

SOUND QUALITY

Audio performance standards were mediocre for a deck in this price area. Basically because of the broad response suck-out centred on 2kHz the inaccurate tonal response with Type IV tapes was heard as a loss of treble detail with much orchestral material rather than the brightness you might expect. The curve only recovered after 5kHz, and this was responsible for some edginess but of course didn't restore the detail.

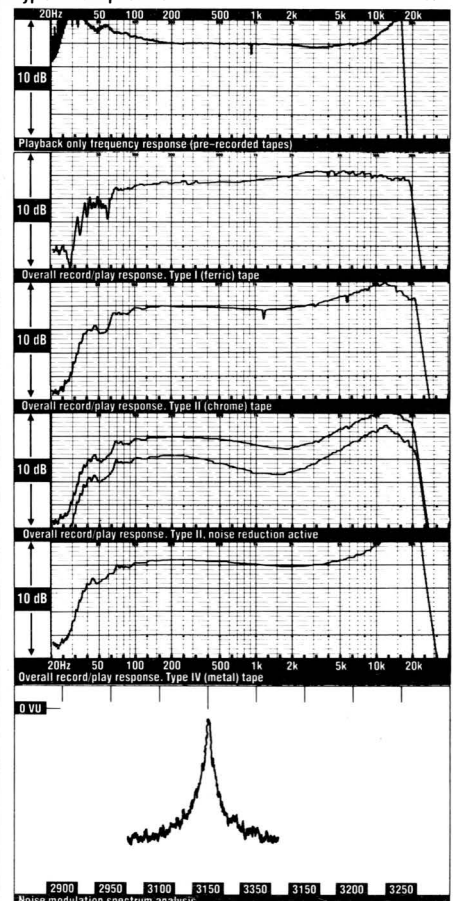
With good Type II tapes, the Philips was back on a more neutral path, but this served merely to highlight other shortcomings, such as a loss of instrumental separation and clarity that seemed to plague the extreme bass and the mid/top area alike. The inherent resolving power of the electronics is simply not up to par. Prerecorded material sounded rather dry in the bass and lacking any real vitality, but in an academic (as opposed to visceral) sense it was OK. In all conditions of use, the deck's aural 'cosmetics' were sound. The poor speed stability figures were never obvious as any instability in pitch, though it was almost certainly contributory to the marked loss of detail, energy and liveliness.

CONCLUSIONS

On paper, this deck sounds like a good idea. It's well priced for a three-head deck, especially one with a features complement like this, and engineering (nee Marantz) appears to be solid enough. Musically however it's disappointing. Despite sounding more stable than the numbers imply, the deck lacks inner clarity, energy and vitality. The bass is mushy and metal tape alignment is not well suited to normally available tapes. Fundamentally you're always aware that you're listening to tape.

TEST RESULTS

Dolby Level reading on deck's meters	-1dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	40Hz - 21kHz
IEC Type II	35Hz - 22kHz
IEC Type IV	35Hz - 23kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.19%/0.25%
Wow/Flutter - Peak DIN wtd	0.14%/0.26%
Speed error	+0.7%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	51.5dB 1.7%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	57.5dB 1.2%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	62dB 3.2%
Noise Figure of Merit (Dolby level/noise Type II)	56.5dB
Crosstalk + Noise ref 0VU/1kHz	46dB
Line input sensitivity/overload	76mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	585mV/3.66V
IM distortion 10kHz/1kHz 0dB peak, 1kHz product	3.98%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	2dB
Dimensions (w x h x d)	42 x 13.6 x 29cms
Average wind/rewind time (C90)	1min 49secs/fast
Typical retail price inc VAT	£250



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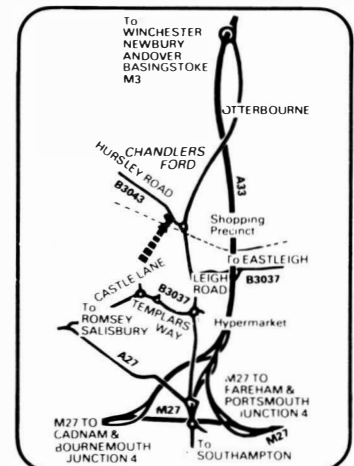
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PIONEER CT-225

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With an airy control layout typical of decks costing maybe twice as much, the CT-225 has a full logic transport with large, light touch controls which do their thing as sweetly and smoothly as anything that doesn't operate on Nakamichi-style gears and cams. More surprising, the deck includes a track search circuit capable of searching up to 15 tracks in either direction. Repeat play is also possible. Dolby C as well as Dolby B (with telltales near the record level meters) are available on the deck, which also has full timer standby with record and play options. Tape type selection is automatic, though in this case there are no telltales. A headphone socket and 26dB peak hold two-colour meters complete the list.

Build quality is simple and lightweight, but not obviously skimpy even though the deck doesn't have the usual Pioneer trademarks like a honeycomb base construction, copper screws and screening and the like. The front panel is plastic, but from any kind of distance, you wouldn't know this deck doesn't cost £200.

LAB REPORT

Neat internal assembly is based on separate audio and control/display boards, a small transformer and a simply engineered single motor transport. ICs include a Sony Dolby chip, with other ICs from Pioneer and Toshiba. Some stiffening of the pressed lid makes it less resonant than usual.

Given the price, the CT-225 emerged from the lab measurement programme with flying colours. Each of the midband responses are accurate, and the treble is accurately sustained, albeit to relatively modest upper limits, metal tapes predictably giving the best numbers, with a -3dB point at 15kHz. Dolby line-up is good, but the replay only response is curtailed in the treble. In all cases, LF behaviour is characterised by an early roll-off - there's little recorded energy below 50Hz with this design - and quite severe contour effects, the 'ringing' in the plots which extends to well over 200Hz.

The spectrum analysis of wow and flutter shows evidence of complex wow effects, perhaps due to slightly off centre rotating parts, but the figures also confirm modest composite wow and flutter levels. Signal/noise levels are also surprisingly acceptable,

though not really good enough to allow useful recordings to be produced without the benefit of Dolby noise reduction.

SOUND QUALITY

This deck was not at its best with metal tapes, which is neither surprising nor particularly disappointing at its price. Although the test results indicate a flat tonal response, the reality was a peculiarly rough, edge-of-the-seat style of music making. It just didn't cut the mustard. Or rather it did, which was part of the problem.

Nancy Griffith's live *One Fair Summer Evening* demonstrated the problems to perfection, though many others could have done in its place. The singer's voice sounded thin and screechy, and lacked character, depth and the subtler qualities that make this album special. The acoustic guitar was thin, and lacked the cavernous bloom which comes off the soundbox. The audience applause between tracks made me back the volume level off sharply.

But replacing the tape with a chrome bias tape, TDK SA, acted as a complete restorative. The treble calmed down, the sound snapped into focus, the test system loudspeakers were at last able to project something approaching a solid stereo soundstage, and the whole effect changed in the direction of consistency and predictability.

With ferrics and chromes - of which the second group proved more energetic and likeable (though objectively the gap wasn't huge), the Pioneer came into its own. The stable nature of the transport provided the kind of pitch integrity that even helped the deck work with piano music, which was intrinsically testing of both pitch and dynamic ability. The Pioneer did well in both departments.

It did slightly less well in some other areas. The 225's electronics were perceptibly 'dirty' in sound when monitored through the test amplifier's tape monitor loop, that is without the tape section being used. In addition, the Pioneer's bass character off tape lacked the essential architecture and weight to be wholly convincing. But at £100, who's arguing?

Prerecorded material was handled very poorly. Quite severe Dolby mistracking was apparent, and the treble had a 'spitchy' hard

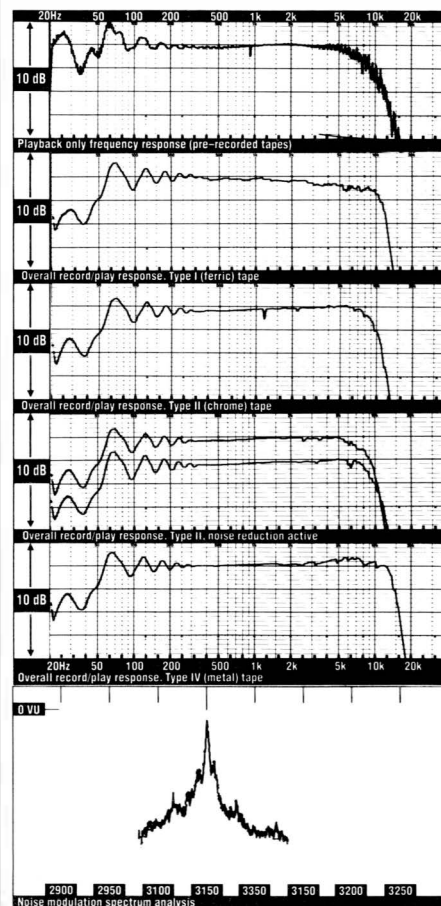
quality. Play speed was also excessive to a degree that will prove audible.

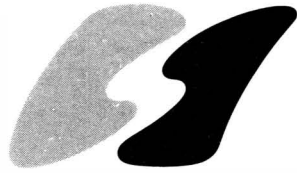
CONCLUSIONS

The Pioneer records well with Type IIs, but it makes a mess of prerecorded tapes and runs fast, the pitch error being quite audible. This is otherwise a well equipped, well presented deck. Worth considering, but a formal recommendation is just missed because of poor setting up standards.

TEST RESULTS

Dolby Level reading on deck's meters	0dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	42Hz - 12kHz
IEC Type II	42Hz - 11kHz
IEC Type IV	42Hz - 15kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.11%/0.22%
Wow/Flutter - Peak DIN wtd	0.07%/0.19%
Speed error	+1.7%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	49dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	54.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	56dB
Noise Figure of Merit (Dolby level/noise Type II)	1.7%
Crosstalk + Noise ref 0VU/1kHz	54.5dB
Line input sensitivity/overload	45dB
Mic input sensitivity/overload	64mV/>13V
Line output for 0dB/maximum	n/a
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	460mV/2.6V
Azimuth check R-L phase at 10kHz	1.37%
VU indication at IEC 0dB	160°
Dimensions (w x h x d)	3dB
Average wind/rewind time (C90)	42 x 12 x 26cms
Typical retail price inc VAT	2mins 34secs/very slow
	£100





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PIONEER CT-335

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Although the *CT-335* is billed as the next model up from the *CT-225*, you might be forgiven for thinking the opposite is true. Even a superficial examination shows that the cheaper model has the edge in at least one important area: the provision made for different tape groups. Where the *CT-225* has the now almost ubiquitous automatic detection of the ID notches on the back of cassette housings, the *CT-335* (the senior model, remember) has manual selection, which, to make things doubly confusing is based on juggling two mutually dependent switches.

In other respects out testee looks better endowed, being strong in facilities that influence sound quality, such as an MPX filter switch, fine bias adjust, Dolby HX Pro and a degree of cassette shell damping. The record level meters have a 28dB range and peak hold indicators, and tape search aids include a mechanical tape counter and a track search device capable of skipping up to 15 tracks forward or back. The unit can be connected to a timer for record or play operations. The logic transport controls are well designed and on the whole are an ergonomic success, and finish is good. Headphones can be connected, microphones can't.

LAB REPORT

In the main the components are of middling to average quality at best, and contained on a standard compressed paper PCB. The main transformer is small, and the internal wiring loom is rather untidy. The transport is a two-motor affair with a belt drive outrigger for the mechanical tape counter. The front panel structure is well supported however, acting as a sound (as in solid) platform for the transport, which is to be counted in its favour.

Most of the performance attributes of this deck are strictly average to middling at the price. Pitch stability is satisfactory both numerically and in the quality and distribution of the error artefacts that do exist, and the effective working dynamic range is good, even with metal tapes, which is a testament to the headroom designed into the electronics.

However, the frequency response shapes are somewhat erratic. Each of the tape groups records with a distinct treble boost at the standard bias setting, and whilst the bias

control more or less sets matters to rights with the lower bias groups, there isn't enough variation in hand to deal adequately with metal tapes. The IEC standard tape used for tests gave a boost amounting to around 3dB above 15kHz even with full bias applied. Pre-recorded material however suited well, though still with a modest 2dB top end lift which may be partly eroded with the azimuth variations encountered with pre-recorded material.

SOUND QUALITY

This deck ran an excessive 2.2 per cent fast on audition, which will be audible even to many less pitch sensitive listeners. The deck was also a little thin and bright when playing pre-recorded tapes with the clear HF peak visible in the plot audible as an edgy prominence and a sibilant one with some vocal material. Another sample of this deck assessed for a different purpose displayed just the opposite tendency, sounding dull with pre-recorded material.

As a recorder, the *CT-335* was an only slightly qualified success. It offered a real measure of transparency, partly due to an excellent transport which kept the loss of clarity that comes with high flutter levels at bay. But it was usually necessary to adjust record bias to achieve an accurate tonal picture, and drop-out was a persistent if intermittent problem.

Like the cheaper *CT-225*, the *335* didn't impress with metal tape stock. Even with the edginess tamed using the bias pot, this type of tape brought out the worst in the deck, including suggestions of instability of output level possibly indicative of tape to head contact problems (these always show up worst with high bias tapes), a flattened, over-etched quality that might be described as hard or metallic, and a quality I perceived as distortion. Good Type Is and IIs (especially the latter) gave much better, more nearly seamless recordings with plenty of detail and life without going over the top. Bass quality was also good for a deck that doesn't cost a fortune. It was a great improvement on the *CT-225*.

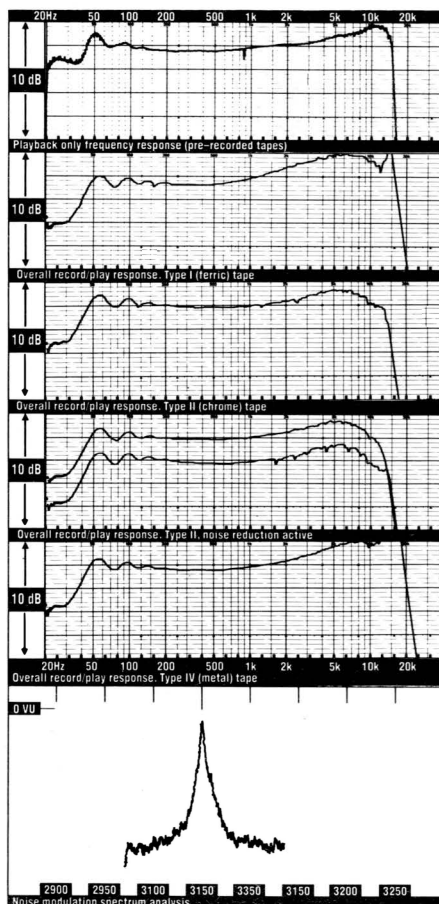
CONCLUSIONS

This is a good, workmanlike and modern cassette deck which works well. It's no world

beater, and as expected it isn't at its best with metal tapes, but it works well with others. However, it ought to work better with prerecorded tapes. Their brightness and lack of stereo depth is disappointing, and the speed error is not easily excusable, though some listeners may not mind. Nevertheless, even prerecorded material sounds much better than with the *CT-225* for example, and although a formal recommendation is just missed, the *CT-335* is certainly well worth considering.

TEST RESULTS

Dolby Level reading on deck's meters	0dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	38Hz - 17kHz
IEC Type II	35Hz - 15kHz
IEC Type IV	35Hz - 21kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.13%/0.19%
Wow/Flutter - Peak DIN wtd	0.08%/0.17%
Speed error	+2.2%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	51dB / 0.75%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	55dB / 0.6%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	55.5dB / 0.8%
Noise Figure of Merit (Dolby level/noise Type II)	55dB
Crosstalk + Noise ref 0VU/1kHz	47dB
Line input sensitivity/overload	73mV / >13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	400mV/2.0V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	2.45%
Azimuth check R-L phase at 10kHz	20°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	42 x 12 x 26cms
Average wind/rewind time (C90)	2mins 25secs/slow
Typical retail price inc VAT	£150





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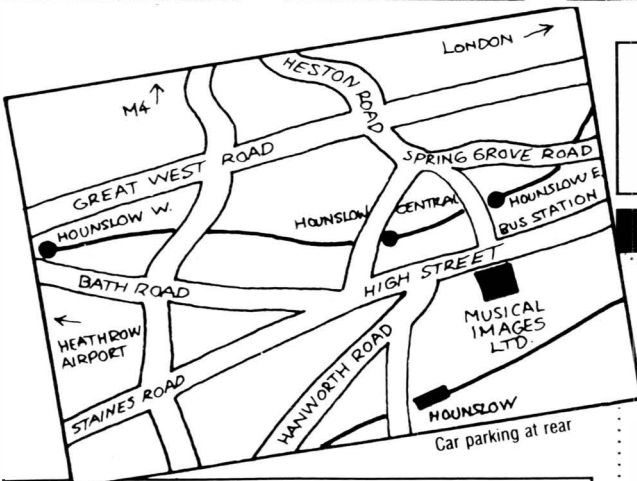
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PIONEER CT-445

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BEST BUY



This is a businesslike looking deck, with a range of features aimed squarely at the enthusiast, such as Dolby HX Pro, an MPX filter defeat switch and a control for adjusting record bias levels. One of the most attractive features is the clear, finely calibrated 28dB range two-colour record level meters (try saying that with your mouth full of beans), though there's no peak hold indicator and this machine retains the archaic two-key tape switching that plagues many other Pioneer models.

The tape counter is electronic and can be switched to read in minutes and seconds as well as the standard proletarian rolling numbers. Tape search facilities include one for finding unrecorded passages following recorded ones (aka blank search) and track search which will go directly up to 15 tracks in either direction. It was disappointing not to find a memory stop device to supplement the otherwise very neat tape counter. Pioneer includes timer standby switching and a headphone socket with a volume control.

LAB REPORT

Pioneer has gone to some lengths to get the physical aspects of this design into good order. The honeycomb base and bracing behind the front panel make the entire structure a good deal stiffer than most, as well as being freer from the effects of structural resonances. And the general standards of build, plus the specification of the components used in important areas is a little better than average. The design relies more heavily than usual on point to point wiring using ribbon interconnects. Even the power supply appears to be better specified than usual at this price level.

The transport, which is very similar to the one used, for example, in the CT-335, has two motors (but note the slow wind speeds) and is fitted with a record/playback head with a hyperbolic profile to reduce 'woodles' - head contour effects which are analogous to ringing in the amplitude domain. The head and other fittings are fixed to a stable head block, and the door includes a cassette shell stabiliser.

On test, pitch integrity turns out to be a little worse than the two cheaper Pioneer decks, which may or may not simply reflect

sample differences rather than anything more intrinsic, but which remains undesirable nonetheless. Spectrum analysis however, shows no overall dominating effects for the ear to latch on to. On frequency response linearity, the shape of the LF response curve is an indication of good head geometry, but there's some mild unevenness at the opposite end of the audio frequency band which is not wholly correctable just by varying record bias.

Replay alignment rates as very good. Noise, distortion and the other figures need no special comment except that the amount of headroom available for metal tapes is a little limited by the best standards, even at this price level.

SOUND QUALITY

The deck illustrated one of the frequently encountered truisms of high fidelity, that musical performance is a subtle and delicate thing. It may be there in abundance in equipment which performs on the lab bench in mediocre fashion, yet be utterly absent from equipment that has text book measurements. The CT-445 measured much like the cheaper CT-225 and CT-335, and in certain respects it was the other two which turned in the better numbers. Yet this deck consistently and considerably outgunned its cheaper counterparts however it was used.

The CT-445 was a persuasive and refined instrument for making recordings. It was almost equally capable with all tape groups, sounding more in control with metals than the cheaper Pioneers, though it was difficult to align the deck for a truly accurate balance with metals, and there probably wasn't a decisive advantage over good Type IIs. Given the very worst interpretation, the latter proved optimum on cost versus performance grounds.

This caveat apart, the deck was lively, clean and capable of very clear, precise and articulate music-making with many types of music. The term 'articulate' in this context means capable of reproducing music with subtlety and expressiveness. Nancy Griffiths, as recorded on the *One Fair Summer Evening* live CD, sounded startlingly more expressive and refined a singer with this deck than the other Pioneer models named above. There were no obviously identifiable

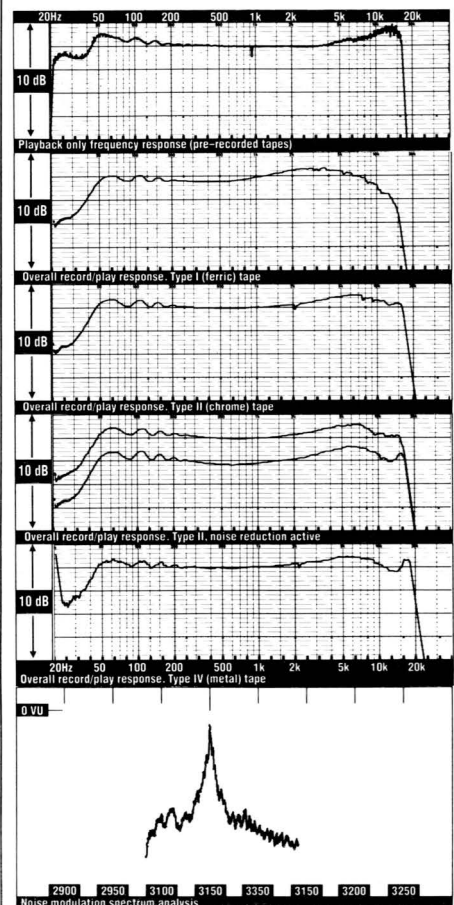
signs of pitch instability even though the numbers weren't wonderful, and the electronics were of a high standard, which certainly helped explain some of the good showing. Prerecorded tapes performed almost as well.

CONCLUSIONS

Despite manual tape type switching, which is a petty and surely unnecessary nuisance, the CT-445 is a first rate cassette deck which deserves the highest accolade at the price. Best Buy.

TEST RESULTS

Dolby Level reading on deck's meters	0dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	33Hz - 15kHz
IEC Type II	30Hz - 15.5kHz
IEC Type IV	25Hz - 20kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.15%/0.22%
Wow/Flutter - Peak DIN wtd	0.09%/0.20%
Speed error	+1.06%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	50dB 0.95%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	54.5dB 0.9%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	54.5dB 1.3%
Noise Figure of Merit (Dolby level/noise Type II)	54.5dB
Crosstalk + Noise ref 0VU/1kHz	46.5dB
Line input sensitivity/overload	96mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	4.89mV/2V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.2%
Azimuth check R-L phase at 10kHz	30°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	42 x 13 x 31cms
Average wind/rewind time (C90)	2mins 17secs/slow
Typical retail price inc VAT	£180



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RECOMMENDED



Rotel's new budget price cassette deck, which took a prodigiously long time in development, turns out to be a slightly old-fashioned looking package. Certain features really are dated, especially the three-button manual tape type selector in a period where, even at this price level, automatic selection is all but universal. And it gets worse. Would you believe a Type II switch labelled 'Special'? The transport control system is also pretty rudimentary, though the semi-powered controls configured in a short row just below the cassette window lack nothing important, and are pleasing enough to use.

The bare bones approach is perpetuated throughout this deck. The meters cover a 21dB range in coarsely calibrated steps and are hard to read anyway. But you do get Dolby B, C and an MPX filter switch. This is all fair enough, but just look at what you don't get. There's no tape search or memory device of any kind, no headphone socket (!), no mic inputs, no fine bias control – and no possibility of your having problems trying to work out how to drive the thing. It's about as obvious as falling off a log, despite the manual tape type switching.

LAB REPORT

Attention to detail can be seen in several places, for example the power supply transformer is carefully oriented to minimise stray field intrusion on the audio circuits. The circuit itself has a sprinkling of better than standard quality components, and the transport uses a single motor – note the ultra-slow wind speeds – with quite a large capstan fly-wheel ironing out some of the deficiencies from this source.

Internal hard wiring, of which there is more than you might expect, is adequately screened, but the record enable switch is triggered by a curious Heath Robinson device based on string and pulleys. It's all rather redolent of the mechanism at the heart of many dial and pointer tuners. Remember dial and pointer tuners?

To help the bass behave with the kind of control and precision that cassettes don't normally possess, Rotel has dreamed up an interesting wheeze. It's eliminated it. There is very little true bass output, the roll-off starting above 200Hz, though the output shape is very smooth – no trace of head con-

tour effects here – and slow. The upper frequencies are also rather restricted, the –3dB point varying as low as 13kHz even with metals. The metal response shape has a slight edge, whilst the replay response run has a very obvious top end peak preceded by a broad, shallow suck-out centred on 3kHz.

However, the Rotel does have one obvious saving grace in the shape of an extremely fine transport for a deck at this price level. Wow and flutter – separately and combined – are amongst the finest tested in this issue at any price level, only the Sony *TC-K730* (at £500) showing a decided advantage in the composite W&F figure. The spectrum analysis shows that the transport is largely free of dominant effects. Noise and THD figures are good, though not outstanding, with around 2 to 3dB headroom available with each tape type using broadband music signals.

SOUND QUALITY

The measured lack of bass was surprisingly innocuous in practice, even using rock music with strong bass lines, classical organ and full orchestra. The lightness of touch and emphasis on higher frequencies however, was perfectly audible, except with recorded music cassettes, which sounded a little dull, although a very real feeling of presence and midband solidity was communicated.

With metal tapes, the deck sometimes sounded over the top. It won't handle high levels with the ease of some of the competition, and the result tended to be edgy or (if driven a little harder) just plain distorted. Ferrics by contrast tended to sound lacklustre and dynamically squashed. It was left to chromes to strike the best overall balance. As a group, they measured more accurately than the others and they sounded clean, surefooted and agile, albeit with a slightly restrained extreme HF, perhaps because the response turned off rather abruptly at 15kHz.

It was the unusual stability of the transport that rescued what otherwise might have seemed a worthy but unexciting performer from possible obscurity. The Rotel set standards at this price by revealing layers of subtlety and expression obscured in other comparably priced decks.

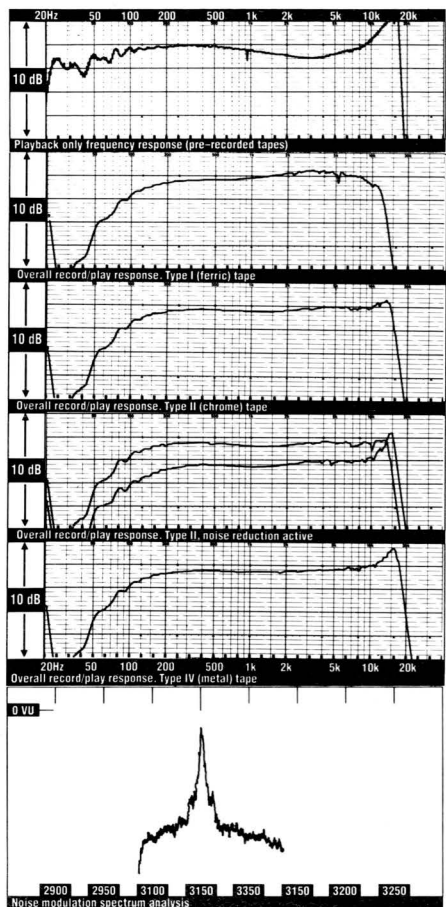
CONCLUSIONS

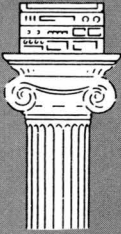
There's no easy way to summarise this one. It

is full of annoyances, some petty, some major, of which manual tape switching and illegible and ugly meters must figure near the top. Metal tape compatibility is poor too (in fairness, it usually is with budget price decks) and prerecorded tapes displayed losses of detail and air. All this removes some of the gloss from what in other respects is an unusually fine sounding cheap cassette deck. Really it should be regarded as a machine for driving chrome bias tapes where its stability and transparency see it through. Recommended but with caution.

TEST RESULTS

Dolby Level reading on deck's meters	–3dB
Rec/replay response –3dB ref 1kHz	
IEC Type I	70Hz – 13kHz
IEC Type II	70Hz – 16kHz
IEC Type IV	70Hz – 19kHz
Wow & Flutter – Peak DIN wtd/unweighted	0.08%/0.12%
Wow/Flutter – Peak DIN wtd	0.07%/0.14%
Speed error	+0.5%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	53dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	56.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	56.5dB
Noise Figure of Merit (Dolby level/noise Type II)	53.5dB
Crosstalk + Noise ref 0VU/1kHz	44dB
Line input sensitivity/overload	46mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	580mV/3.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	2.51%
Azimuth check R-L phase at 10kHz	45°
VU indication at IEC 0dB	0dB
Dimensions (w x h x d)	44.3 x 14.3 x 26.5cms
Average wind/rewind time (C90)	2min 44secs/very slow
Typical retail price inc VAT	£130





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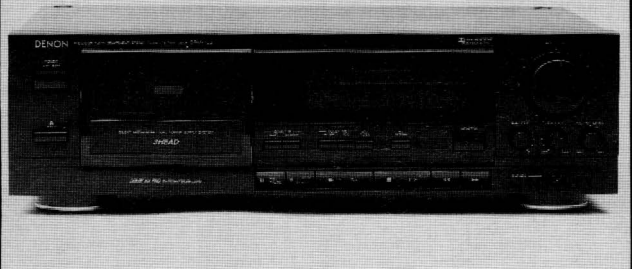
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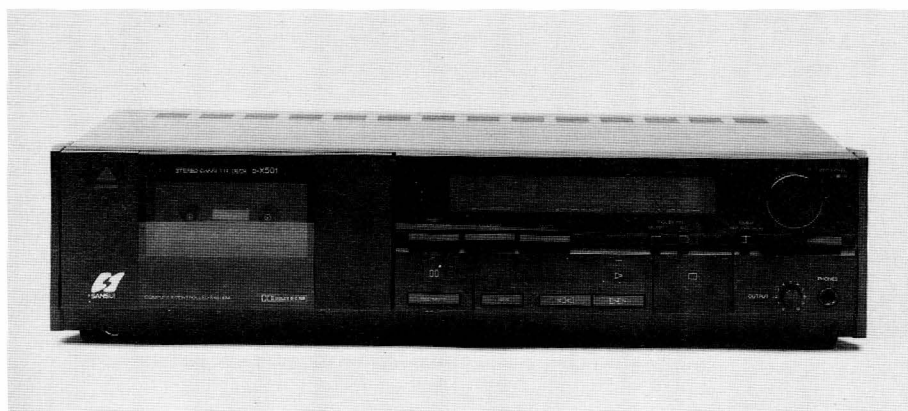
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Here is a simple, almost minimalist unidirectional cassette deck which has Dolby B and C noise reduction, but for once omits Dolby HX Pro. Headphones can be connected through a volume control which unfortunately also varies the main output feed at the rear. The display includes a fully lit set of meters with a 48dB range and an electronic memory counter. The counter is replaced by a track number read-out when the AMPS function is invoked. AMPS allows random track access for tracks up to 15 away from the present position in either direction. And that, folks, is about the size of it.

Apart from a power switch that is all too readily confused with the record level control, I like the ergonomics of this player. The controls are so big and so well differentiated, it is possible to operate the deck successfully with the sharp end of a broomstick, and probably without stirring from the armchair. The one touch record level control also helps. Record level meters and other displays are exceptionally clear, and well designed cassette well illumination helps provide an excellent view of how much tape has gone, and how much is yet to go. I also like the outside cassette door which you simply tap on the left hand side to open. It's all elegantly and neatly accomplished.

LAB REPORT

The case is made from a mixture of plastic and steel components – plastic for the fascia and side panels, bent steel for the base, back and top cover. Internal construction is rather scrappy in appearance, and some components are a little less accessible than usual. The audio circuits are not separately screened, and there's a surprising amount of loose internal wiring.

The single capstan transport uses one reel drive and one capstan motor, both DC types, but the benefits of specialisation fail to prevent the machine turning in quite tardy fast forward and rewind speeds. Wow and (especially) flutter is also discouragingly high, in fact the highest numerically of any of the 20 machines tested, and barely of a standard that deserves to be described as high fidelity. The unweighted figure for flutter dwarfs any of the others at 0.48 per cent, and at 0.16 per cent, wow is about twice the average level and nearly *eight times* as high as the best,

which in this report is the Sony *TC-K730ES*. The broad shape of the 3150Hz peak in the spectrum analysis pen plot tells its own all too eloquent story of capstan wow and other more widely distributed anomalies.

Most of the frequency response pen charts look very acceptable, even at the frequency extremes, but both Dolby circuits introduce anomalies into the amplitude domain, giving a top end boost of a dB or so. The real effect, however, is rather more complex due to the non-linear way in which the Dolby circuits operate. Paradoxically, the noise and distortion picture is rather better than average – better even than the more costly *D-X701* except when measured using more demanding metal bias tapes.

SOUND QUALITY

I started this test with prerecorded musicassettes, most of which sounded dynamically flat and splashy at high frequencies, despite a mildly falling measured response. The loss of detail, depth and dynamics were all too obvious with too many tapes to be anything other than real.

The unfortunate but inevitable fact was that the deck was not an outstanding success when making recordings either. There were clear differences between the three tape groups, and for what it's worth the deck seemed well enough adapted to the special properties of metal tapes, though this is a long way from saying that it made the most of metals. There was more HF headroom with metal tapes, and a brighter, more energetic balance. Ferrics were often quite soft when driven hard.

But this was outweighed by the more general findings which were apparent to much the same extent with all three tape groups. In short, the *'501* sounded synthetic and edgy. In the absence of any means of adjusting record bias, the intrinsic response shape of the tape is going to show through, and in the majority of cases this meant a rather thin, bright sound, especially when using either Dolby circuit. It also meant an edgy one, with frazzled leading edges and percussion sounds, whilst a lack of real pitch precision badly affected some material, for example piano and woodwind. The generalised finding was of flatness of image, loss of detail and recordings that simply didn't have the

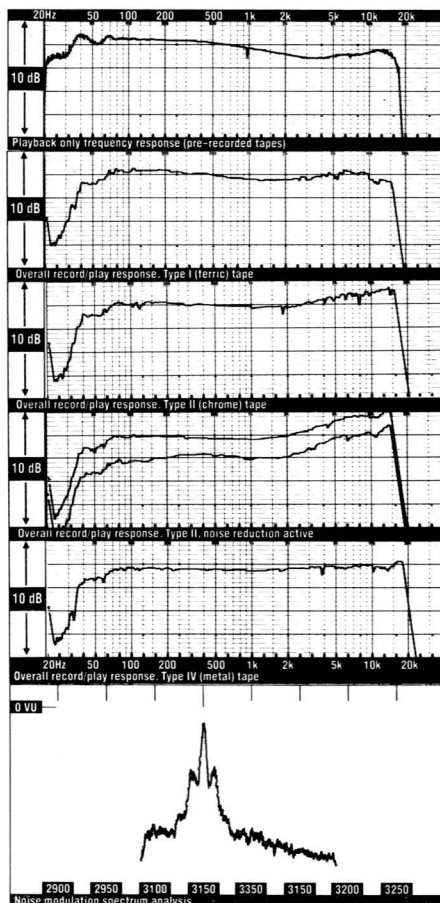
consistency or articulation to work properly.

CONCLUSIONS

There's no doubt that the musical integrity and engineering of this deck suggest that it's considerably overpriced at present. The transport needs to be re-engineered too, since as it stands it is unsuitable for a hi-fi machine at any price. Having said this, the *501* is attractive, externally well designed and very easy to operate. If the inside had been as good as the outside, buyers would be beating a path to Sansui's door.

TEST RESULTS

Dolby Level reading on deck's meters	-1dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	32Hz-16kHz
IEC Type II	32Hz-17kHz
IEC Type IV	32Hz-20kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.23%/0.42%
Wow/Flutter - Peak DIN wtd	0.16%/0.48%
Speed error	-0.1%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	53.5dB/0.6%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	57dB/0.9%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	57.5dB/3.1%
Noise Figure of Merit (Dolby level/noise Type II)	56dB
Crosstalk + Noise ref 0VU/1kHz	49dB
Line input sensitivity/overload	109mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	610mV/2.4V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	6.3%
Azimuth check R-L phase at 10kHz	45°
VU indication at IEC 0dB	3dB
Dimensions (w x h x d)	44.7 x 11.1 x 30cms
Average wind/rewind time (C90)	2mins 14secs/slow
Typical retail price inc VAT	£230



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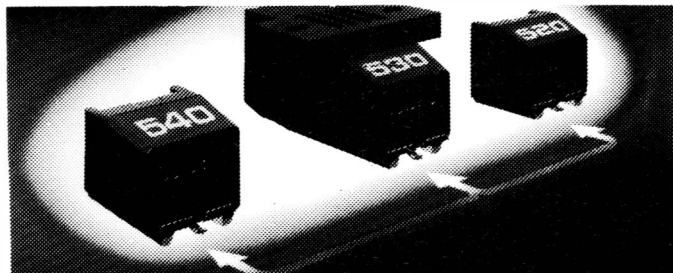
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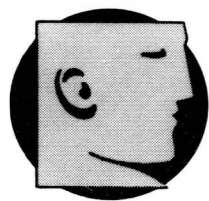
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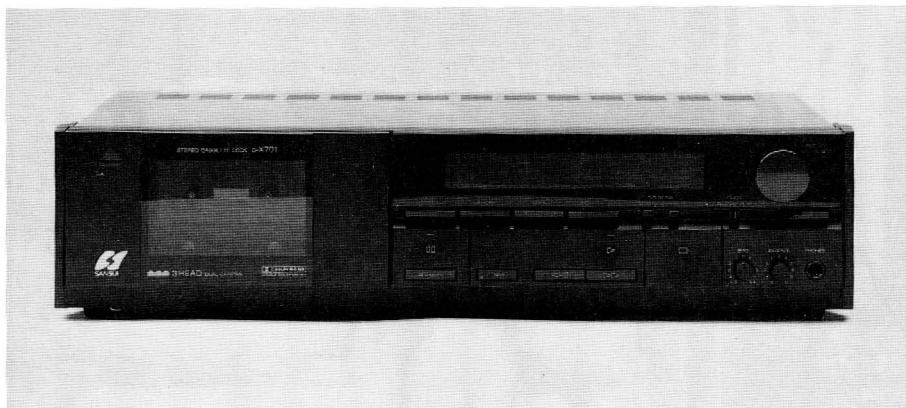
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The *D-X701* and *D-X501* (reviewed separately) look almost identical, the key difference being the substitution of the combination record/playback head by separate dedicated record and playback heads. This as you probably know enables recordings to be monitored as they are taking place.

Although the *701* looks very similar to the *501*, there are a couple of minor differences. The *501* you may recall had Dolby B and C noise reduction – there's no Dolby HX Pro – an electronic memory tape counter, wide ranging (48dB) record level meters and a track search device capable of seeking out tracks up to 15 away from the current position, either forward or back. The *701* also has a bolt on extra in the form of a variable bias control, which is effective with all tape groups.

The *501's* admirable practicality and simplicity is retained in this model, along with an unusual and attractive visual treatment. The meters and displays are all yellow and red, with large, clear legends. Particularly neat details are the plastic moulded side capings and the well lit cassette well. Tape/source switching is a curious hybrid of manual and automatic: basically automatic, it switches from tape to source feed only if pause is selected when recording. Press stop instead, and the tape feed is retained, and silence descends.

LAB REPORT

The Sansui house style of the *501* is equally evident here. However, instead of one edge-wise added PC board for the Dolby circuits there are two to accommodate the two Sony Dolby ICs needed to allow real time monitoring of the decoded signal – the *501* of course doesn't allow monitoring. The other main features are very similar, not least the higgledy-piggledy way many of the audio components have been inserted, and the complex internal wiring loom. The part plastic, part pressed steel case is very much in the *501* mould too, and is stiffened with a brace from front to back in much the same manner. The dual capstan transport is driven by two motors, one driving the capstans and the other the tape reels in the usual way, and the two heads are siamesed. All in all, the Sansui is not, and was obviously never meant to be, a cost no object package, but it's an

interesting and obviously well considered one.

Be this as it may, the *D-X701* performs creditably on the test bench. The transport gives acceptable if not outstanding levels of pitch stability and a clean looking spectrum when plotted out in the usual way, though the measured wow figure is rather higher than desirable. Curiously though it's the cheaper Sansui *D-X501* that offers the better noise and distortion figures, the Type II noise Figure of Merit being a full 3dB worse with this more costly design. The response shape produced by the prerecorded test tape was acceptably accurate, though other decks have done better, but all three tape groups give very flat, accurate record/replay responses and a clean bottom end indicative of favourable head geometry, which isn't always the case with siamesed record/playback heads.

SOUND QUALITY

There were quite high levels of hum (100Hz, 200Hz etc) from this player, which became more, rather than less obvious with the noise reduction circuits engaged since the frequencies concerned lay outside even the Dolby C operating band. Most of the time, the LF noise was easily smothered by the music, but it appeared to contribute to a smudging and smothering of low level detail during quiet passages. At more normal listening levels, there was also a loss of harmonic depth and variety. In one case (I was recording a lushly orchestrated piece of Ravel: *Alborada del Gracioso*), I thought half the players had dropped out when I switched to tape monitor. Recorded piano transients were muffled too. The Sansui tended to strip detail and presence from the sound.

The problems highlighted were not gross though, and the bottom line is that on the whole the deck made pretty good, faithful recordings. The Dolby circuits were generally satisfactory, but for once Dolby C sounded a little livelier than Dolby B.

The comments made so far apply to metal tapes only. Type Is and IIs generally sounded flatter (spatially, tonally and dynamically) especially when driven hard with suitably dynamic material. On the other hand, I was happy with the way prerecorded material was handled with this deck; my test tapes

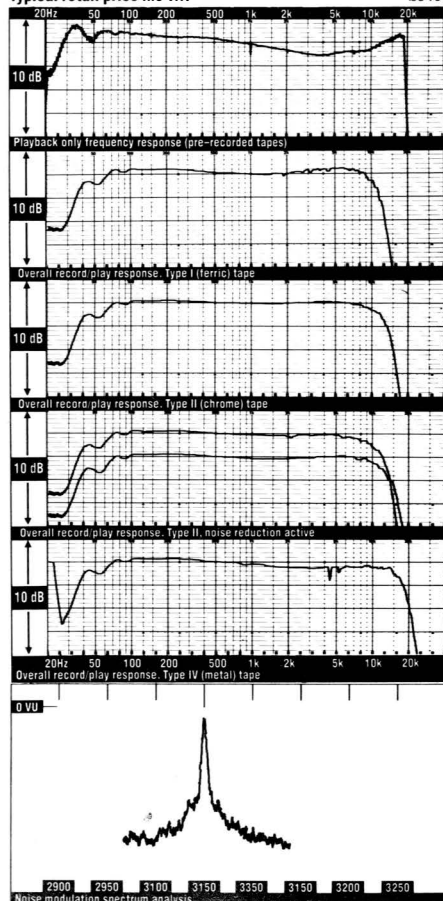
sounded clean and atmospheric.

CONCLUSIONS

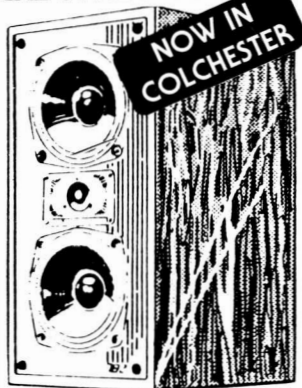
Although there are quite a few detailed criticisms of this recorder – not untypical of middle price cassette decks from any source – the Sansui still strikes me as a competent, if flawed, package that works well with prerecorded tapes and makes decent recordings, especially with metal tape formulations. The deck is also easy on the eye and an unusual pleasure to use. A formal recommendation isn't warranted, but it's a close run thing, and it is certainly well worth considering.

TEST RESULTS

Dolby Level reading on deck's meters	0dB
Rec/replay response – 3dB ref 1kHz	
IEC Type I	32Hz – 12kHz
IEC Type II	32Hz – 14kHz
IEC Type IV	32Hz – 19kHz
Wow & Flutter – Peak DIN wtd/unweighted	0.14%/0.23%
Wow/Flutter – Peak DIN wtd	0.11%/0.18%
Speed error	–0.5%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	48.5dB 0.6%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	53dB 0.6%
Type IV signal/noise CCIR/ARM 400Hz & distortion + 3VU	54.5dB 0.65%
Noise Figure of Merit (Dolby level/noise Type II)	53dB
Crosstalk + Noise ref 0VU/1kHz	43dB
Line input sensitivity/overload	90mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	560mV/1.5V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	1.4%
Azimuth check R-L phase at 10kHz	5°
VU indication at IEC 0dB	1dB
Dimensions (w x h x d)	44.7 x 11.1 x 30cms
Average wind/rewind time (C90)	2mins 8sec/average
Typical retail price inc VAT	£340



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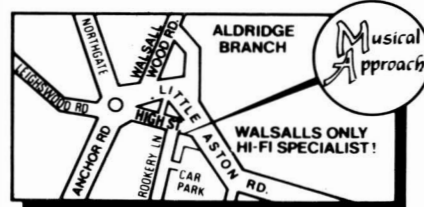
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This is the junior model in Sony's prestige *ES* line-up, and although it looks well filled from a distance, it is noticeably short of needless gimmickry. Although modern in appearance, in common with its senior brother, the *TC-K730ES*, it has some curiously old fashioned details. A typical example being the three-head design with a rotary switch to select the source or tape feed.

Other facilities are limited to the standard Dolby B/C/HX Pro set (with MPX defeat), variable bias and a headphone outlet with volume control. You also get an electronic tape counter which reads in minutes and seconds, and a memory stop switch. An additional dual function switch provides intro and track search (labelled Music Scan and AMS by Sony, obviously keen to score one for its marketing dept). Auto play following rewind and blank skip completes the list. The latter can be used to 'close up' gaps during playback, or to repeat an individual track selection.

LAB REPORT

Much of the *TC-K630ES*'s technology and some of the raw materials (though Sony's components are never very raw) come from the flagship *TC-K730ES* which is reviewed in this issue. The playback head is of laseramorphous construction with LC-OFC windings; the record head is permalloy. For the most part, the unit is unremarkable in construction, though it's notable that Sony uses several power supplies for the various circuit areas. Although the materials content is far from extravagant, build quality and serviceability are both good. The single capstan transport uses separate reel and capstan motors and gives every indication of having been extremely well engineered.

On the test bench at least, this cheaper Sony *ES* cassette deck is, I'm sorry to say, not particularly impressive. The transport is a case in point, lacking the impressive stability of the senior model. The composite weighted wow and flutter figure is a rather ordinary 0.14 per cent, largely due to the presence of wow sidebands (see spectrum analysis), which can be expected to be just audible with certain types of music (see Sound Quality).

The frequency responses are also somewhat erratic. The metal (Type IV) shape is the best sustained and most accurate at the

standard metal bias setting. Whilst the other two can be more or less ironed flat using the adjustable bias facility. The Dolby circuits impose their own weaving in the pen charts which adds up to a slight dulling and added sense of compression when the translation is made from numbers into music. The replay only response shape is generally favourable, though again the response shape is mildly dished. Tape to head contact integrity is also slightly suspect with this model, drop-out in particular being more frequent and obvious than usual.

SOUND QUALITY

Technical analysis of cassette decks seems like a pretty cut and dried process, but this one stubbornly refused to live down to the numbers. Despite the mediocre wow and flutter figures, it was difficult to pinpoint anything that could be identified as wow or lack of pitch precision. Listening results have to be the final arbiter of course, so that's that.

The Dolby circuits also made interesting listening. Some compression was noticed on Dolby C, along with a definite suggestion of hardness, lending what can be described as a wooden quality to the percussive edge of recorded piano and other instruments. With Dolby B switched in however, recordings sounded less compressed, and the hardness was lifted. The treble opened out further with the MPX filter defeated.

The *630* sounded about as good as it could (if spatially rather flat) with a combination of metal tape and Dolby B. Correctly biased, Type II tapes like TDK's *SA-X* sounded very good too, but with the merest whiff of a loss of presence, vitality – call it what you will. Much the same applied with ferric tapes too, with bells on. Prerecorded tapes sounded fine. A little too brightly lit, but fine.

Leaving these detailed points to one side, the common factor was a good but not outstanding basic standard of sound quality. The bass tended to sound tight and tidy, whilst the treble was generally good but at times slightly raw and edgy. Switching from source to tape when recording from a good record or CD player, with the deck optimally adjusted to the tape in use, introduced a mild but noticeable smudging and defocusing of stereo generally and the treble in particular

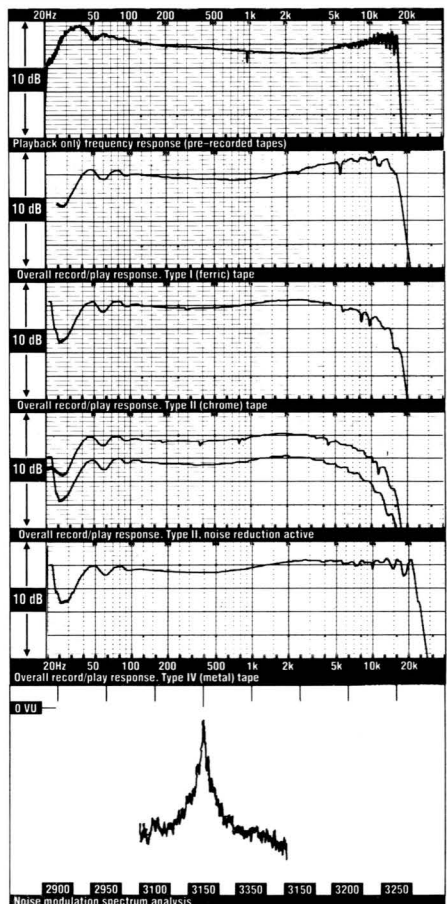
and some relaxation of the soundstage image. This deck is pretty good, but it doesn't set standards. It follows them.

CONCLUSIONS

Poor setting up rather than intrinsic limitations in the hardware may be held responsible for some of the findings, which can only be summed up as a little disappointing for a £300 deck wearing the prestige *ES* badge. It's not bad by any means, but it's by no means a market leader.

TEST RESULTS

Dolby Level reading on deck's meters	-2dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	25Hz - 17kHz
IEC Type II	25Hz - 15kHz
IEC Type IV	25Hz - 22kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.14%/0.24%
Wow/Flutter - Peak DIN wtd	0.08%/0.25%
Speed error	+0.5%
Type I signal/noise CCIR/ARM 400Hz & distortion OVU	48.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion OVU	54.5dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	55dB
Noise Figure of Merit (Dolby level/noise Type II)	1.2%
Crosstalk + Noise ref OVU/1kHz	52.5dB
Line input sensitivity/overload	44.5dB
Mic input sensitivity/overload	111mV/>13V
Line output for OdB/maximum	n/a
IM distortion 10kHz/11kHz OdB peak, 1kHz product	777mV/3.8V
Azimuth check R-L phase at 10kHz	0.125%
VU indication at IEC OdB	20°
Dimensions (w x h x d)	2dB
Average wind/rewind time (C90)	43 x 12.6 x 33.5cms
Typical retail price inc VAT	2mins 3secs/average
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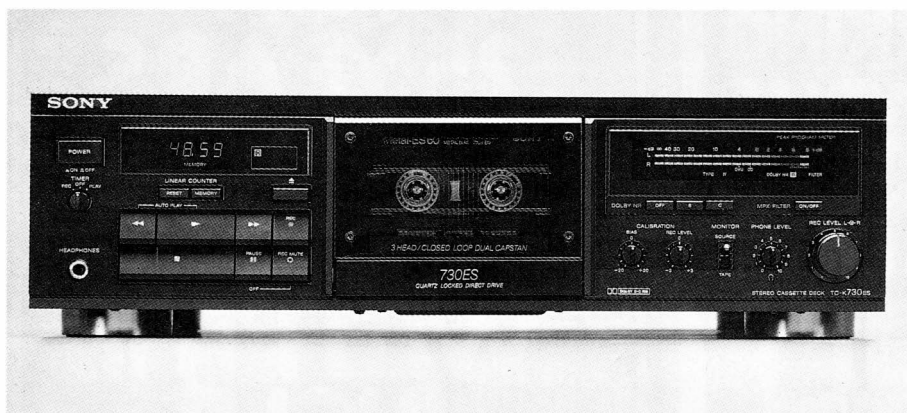
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SONY TC-K730ES

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RECOMMENDED



Sony's ES series flagship, the TC-K730ES, has a rugged, well engineered feel, backed up by a weight more appropriate to a power amplifier of the same size. For purely functional reasons discussed in the Lab Report, the internally illuminated tape compartment is mounted amidships, with the transport control section and tape counter to the left, and the various audio controls and remaining displays on the right. This compartmentalised approach makes for a very rational, easy to use product. The good ergonomics are further assisted by the small number of superfluous controls and by the well thought through nature of those that are provided.

This is a three-head recorder, with manual tape/source switching, supported by wide ranging 48dB two colour peak hold meters. Two tape calibration controls are also fitted: for bias and sensitivity.

I was intrigued to discover that although it has the usual noise reduction complement from the Dolby stable, Dolby HX Pro has been omitted from this flagship model. The 730ES does have a real time counter and can perform such simple minded tricks as memory stop and play, and auto play following rewind. Finally, a simple remote control is supplied, the RM-J600, which adds controls for CD synchronisation when recording.

LAB REPORT

Borrowing techniques of construction from the TC-K700ES, the 730 is divided internally into three entirely separate, self contained compartments, with the microprocessor based control electronics and the audio circuits flanking the centrally mounted and fully screened transport and power supply section. The two channels are symmetrically disposed on separate record and playback boards. Electrical isolation and a short signal path are obvious benefits, in addition to which the physical construction of the unit is very solid.

The power supply itself is big enough for a respectable integrated amplifier, consisting of a large frame transformer feeding a pair of 35V 6800µF high grade Elna reservoir capacitors. The transport is a beautifully crafted item fitted with a sophisticated three-phase quartz referenced direct drive capstan motor, and a single reel motor. The tape traverses the heads within a closed loop

tightly defined by the dual capstan drive system. Laseramorphous alloy heads are used in this recorder, which claim good wear resistance and upper frequency performance.

Surprisingly the record/replay frequency responses for Type II and IV tapes (the important ones with this class of product) are wayward. Suitable settings of the bias control (11 o'clock for Type II and 9 o'clock for Type IV) give nearly flat results for IEC standard tapes, but even here responses are not perfect. It's impossible, for example, to eliminate a 1dB deep wideband depression between about 2-8kHz with metal tapes without incurring a sharp sting in the extreme treble resulting from underbiasing. The playback response shape is also all over the place, and not correctable without internal adjustments. All the other measurement parameters however, are good, and the transport is magnificent, easily amongst the best I have ever encountered.

SOUND QUALITY

The 730ES was in almost every sense a joy to use, but I was disappointed by the rather loud clicks from the solenoid engagement plungers. Surely a gentler acting system, perhaps based on gears and cams, would have been more appropriate to a deck at this price level?

Performance was first rate, even when it failed the neutrality test. The bass had a firmness and sureness when copying well recorded CD sources that led to recordings that sounded much more like CD than the blurred LF waffle that passes for bass on many cassette decks.

The drive and momentum continued through the midband, and deep into the treble, producing, for once, a homogenous (but not homogenised) whole. Treble clarity was nothing less than outstanding, and imagery at best very explicit and stable. The normally almost subliminally perceived instability endemic to the medium was absent. Sony has succeeded in making a cassette deck which is all but inaudible in its own right, leaving the music to speak for itself.

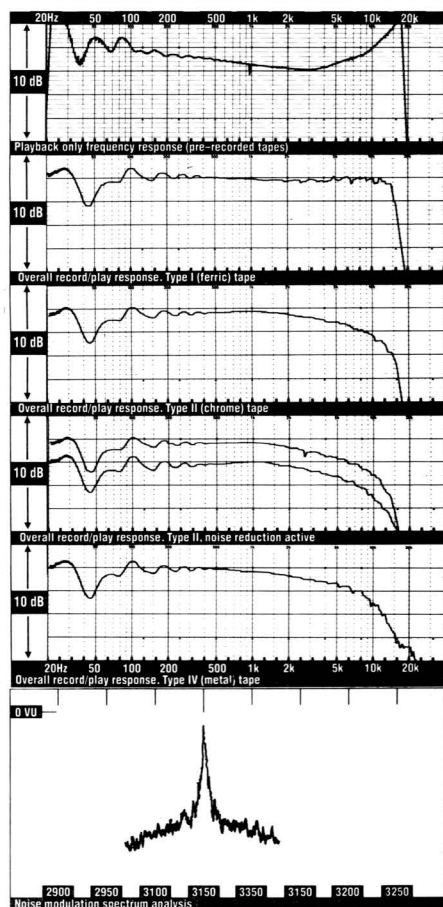
CONCLUSIONS

Good as it is, and I've given this deck well deserved Recommended status, a question mark must hang over any deck that's this

expensive in the run-up to Dolby S, which may – I repeat *may* – change our ideas about which way the compact cassette is going. Nevertheless, and despite the odd foible highlighted in the text, I found the musical performance of this machine remarkably enjoyable, despite a charmingly dated feel. The electronics are very sweet and open sounding, and the tape stages (everything in the tape monitor chain) do remarkably little to detract from this good showing.

TEST RESULTS

Dolby Level reading on deck's meters	–1dB
Rec/replay response –3dB ref 1kHz	
IEC Type I	<20Hz – 16kHz
IEC Type II	<20Hz – 12kHz
IEC Type IV	<20Hz – 10kHz
Wow & Flutter – Peak DIN wtd/unweighted	0.04%/0.09%
Wow/Flutter – Peak DIN wtd	0.022%/0.08%
Speed error	+0.1%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	48.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	55dB
Type IV signal/noise CCIR/ARM 400Hz & distortion 0VU	56dB
Noise Figure of Merit (Dolby level/noise Type II)	54dB
Crosstalk + Noise ref 0VU/1kHz	45dB
Line input sensitivity/overload	109mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	703mV/5.8V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	2.8%
Azimuth check R-L phase at 10kHz	70°
VU indication at IEC 0dB	2dB
Dimensions (w x h x d)	43 x 12.5 x 34cms
Average wind/rewind time (C90)	2mins 0secs/average
Typical retail price inc VAT	£500

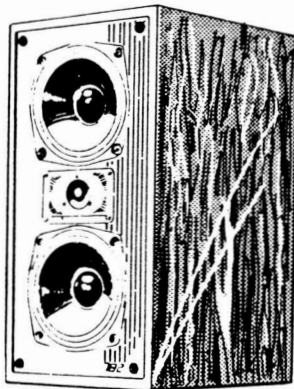


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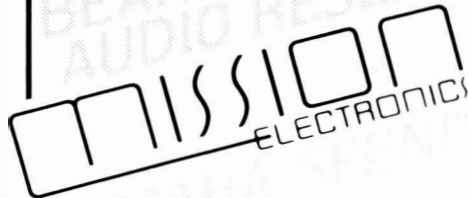
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TECHNICS RS-B555

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BEST BUY



The RS-B555 is a well equipped unidirectional cassette deck, featuring Dolby B, C and HX Pro headroom extension circuitry, and the usual automatic tape type selection and similar mod cons. Most decks in this price area have simple record level meters with just the moving columns lit and either a mechanical tape counter or a very simple electronic one. The RS-B555 on the other hand is equipped beyond the standards of most of its contemporaries with impressive looking high resolution peak hold meters with illuminated scaling and a switchable facility to enable peak levels to be held indefinitely. This has obvious applications when trying to determine the maximum recorded level on a recording (from say, a CD or record) which is being dubbed on to cassette. Somewhat superfluously, the meters can be switched between two ranges - 46dB and 15dB. The tape counter is electronic (but you already guessed that, didn't you?) with memory stop and A-B repeat modes.

The full list includes track search (next/current only), microphone input sockets, a headphone level adjust control to supplement the output jack, bias adjust for Type I and II tapes and full timer standby switching.

Finished in Technics' usual house colour, a dark chocolate brown, the deck is at once cleanly cut yet rather fussy looking, though most of the styling features are nothing if not practical, and control feel is extremely good. The only snag is that everything has been done on a thoroughly Lilliputian scale, with controls designed to suit the standard issue Japanese finger.

LAB REPORT

The power supply is modest in specification, as is the standard of most of the audio components. The impressive two-motor transport however, boasts a quartz locked direct drive type capstan motor and a separate reel drive motor, and Technics uses two separate Philips Dolby IC processors in place of the usual monolithic Sony chip. Build and engineering are strictly utilitarian, which is not too surprising at this still quite modest price level. The record amplifiers are built using Technics proprietary Class AA technology in which a Class A voltage driver stage feeds a non-switching current drive output, a configuration said to be intrinsically linear

and well adapted to coping with the reactive load of the head itself.

The RS-B555 is very well aligned, the frequency responses being particularly accurate, with excellent midrange linearity and smooth, well extended behaviour at both frequency extremes, though the Type IV response shape (and the Type II one at the standard bias setting) is about 0.5 to 1dB shy in level over a wide bandwidth centred on 1-2kHz. The bass extends flat to near 30Hz, and without undue head contour effects ('woodles'), whilst the treble is equally impressive with all tape groups at the standard bias settings, with accurate Dolby alignment to suit. The replay response could almost have been drawn with a ruler. Working dynamic range is also impressive with all tape groups, and, crucially, wow and flutter figures are equally excellent, the wow figure especially, despite a touch of what is probably especially capstan wow (see spectrum analysis plot).

SOUND QUALITY

Refinement wasn't this deck's strong suit: there were occasions when the Technics sounded a touch over emphatic and sibilant, but resolving power was of an extremely high order, and the deck had an overall consistency of approach that made it surprisingly easy on the ear as well as being informative.

Prerecorded tapes were accurately handled, with the merest suggestion of treble excess and ultra-stable pitch integrity, a hallmark of this deck. The crispness of presentation was underlined by a rather dry bass quality imposed by the recorder's amplifier circuits and a somewhat clinical, constrained midband as reproduced off tape. The deck was electrically quiet with negligible hum levels, and with a good, quiet Type II tape could be used without noise reduction even in quite sparsely recorded material without danger of tape hiss becoming intrusive. Using either of the two Dolby noise reduction circuits resulted in some smear, and the deck sounded best without, though there was a suggestion of artificiality at times.

The Technics appeared to be more or less equally comfortable with all three tape groups. TDK SA-X (a Type II) was particularly well suited to the deck's capabilities

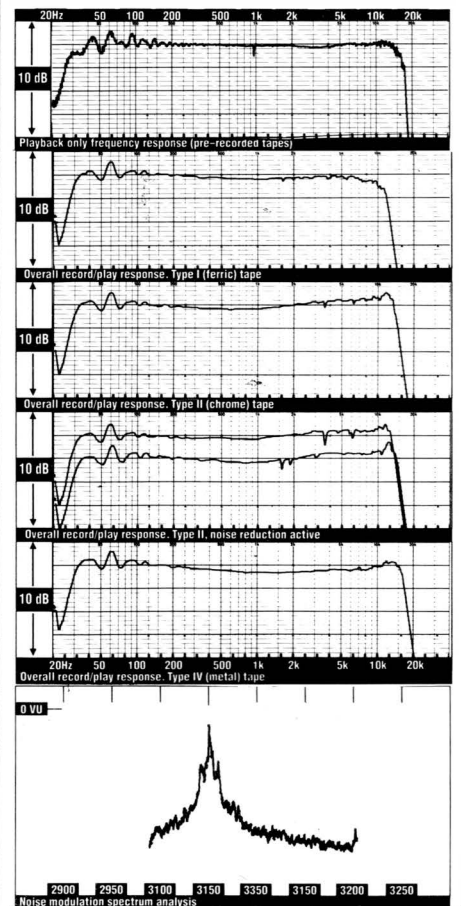
due partly to its supremely low noise levels, and metals were effectively but not ideally handled, as there was little perceived dynamic advantage to be reaped.

CONCLUSIONS

A first rate near-budget recorder, the RS-B555 is not quite as smooth or as euphonious as some, but it is extremely quiet, stable and detailed, and is accurately set up, which makes a change. A clear Best Buy.

TEST RESULTS

Dolby Level reading on deck's meters	+2dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	25Hz - 12kHz
IEC Type II	25Hz - 15kHz
IEC Type IV	25Hz - 17kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.10%/0.17%
Wow/Flutter - Peak DIN wtd	0.05%/0.14%
Speed error	+0.4%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	48.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	0.6%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	53dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	0.48%
Noise Figure of Merit (Dolby level/noise Type II)	55dB
Crosstalk + Noise ref 0VU/1kHz	47dB
Line input sensitivity/overload	146mV/7.52V
Mic input sensitivity/overload	0.4mV/20mV
Line output for 0dB/maximum	640mV/3.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	0.16%
Azimuth check R-L phase at 10kHz	40°
VU indication at IEC 0dB	4dB
Dimensions (w x h x d)	43 x 12.5 x 28cms
Average wind/rewind time (C90)	2mins 1sec/average
Typical retail price inc VAT	£160



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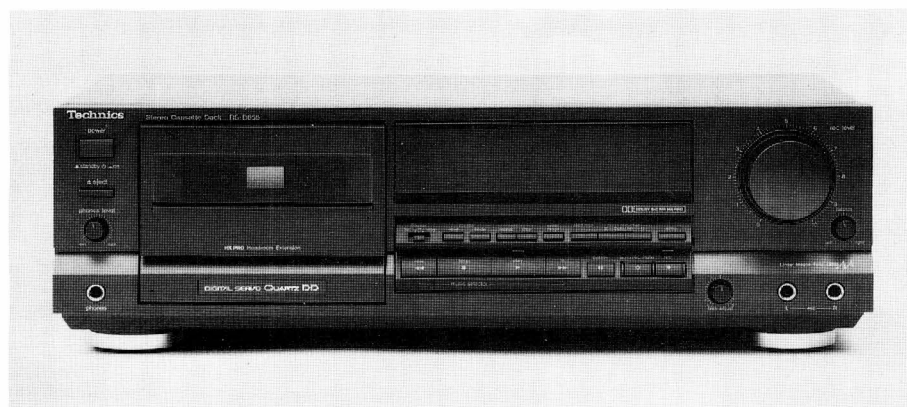
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TECHNICS RS-B655

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BEST BUY



The Dolby HX Pro equipped *RS-B655* is a unidirectional machine closely related to the *RS-B555*, with the usual style of single capstan transport.

By any standards, this is a button bound deck, but on the whole the layout is subtly designed and easy to get to grips with, *provided* you have excellent eyesight and small fingers. The most immediately impressive feature however, is the large and complex display panel, whose coup de grace is an extremely long and unusually finely calibrated record level meter. It can be switched to read from -30dB to $+16\text{dB}$ in best case 2dB steps, or -7dB to $+8\text{dB}$ with 1dB resolution. Wonderful as this sounds, the narrow range display is plainly surplus to any practical requirements, real or imagined, and must be regarded as a gimmick. Some people may also find the tiny digits of the illuminated display scale unnecessarily hard to read from any distance, though the use of two colours for above and below 0VU makes things clear enough, but the flickering of some of the display LEDs when viewed obliquely is not so easily forgiven. This is the second sample of this deck I've seen with the same fault – hopefully this isn't endemic.

There are few other complaints. The display area also has an electronic time/number display (apart from the display, this is the only obvious difference from the *RS-B555*) and a variety of status indicators. Altogether it makes quite a light show, and rather an obtrusive – even *intrusive* one at that.

Track search supplements the counter. There are memory stop and repeat options which are triggered by the tape counter, and a device called APRS which stores the peak levels encountered whilst setting up for a recording. The record level control is then adjusted to place the peak where you want to – say $+5\text{dB}$ ref 0VU , depending on tape type. Bias levels are adjustable (with Type I and II only), as is headphone monitoring level.

LAB REPORT

This deck looks very like the *RS-B555*. The circuit is modestly specified on the whole and uses a smallish power supply, but the transport (with direct drive capstan motor) appears to be very well made. Although the fascia is no more rigid than most, the base is underpinned structurally to increase rigidity

and reduce microphony.

In the analysis some relatively high frequency wow effects are apparent at a level that might be just audible, though in its favour the numbers achieved on test are far from unimpressive. There is some unevenness of output affecting the upper frequencies in particular, not an uncommon problem with the cassette medium.

Frequency responses are accurate or a little bright, depending on tape type, but little is the operative word here, and the playback only response is about as accurate as they come. Effective dynamic range is wide with all tape groups, metals included, which rounds off an impressive array of test bench results. So, how does all this translate into music?

SOUND QUALITY

The answer is simple: it translated extremely well. The description of plus and minus points – such as there were of the latter – mirrored almost precisely those made of the *RS-B555* (reviewed separately). There was a difference however. The measurements painted a clear picture of the *RS-B655* as a deck with slightly inferior standards of setting up to the cheaper model, the frequency responses being slightly more erratic, and the wow and flutter levels a little higher. The difference in signal/noise and distortion were too close to call. Despite this, the sound quality of the *RS-B655* was superior to the already very good junior model. Although the deck sounded slightly manipulative, it was significantly more relaxed, expansive and neutral, both dynamically and spatially.

Other observations were very similar to those made of its stablemate. The *RS-B655* had high standards of stability and tonal accuracy over which is superimposed some roughness when suitably excited. This was by any standards an impressively clear and articulate sounding deck, and again is better served by high grade, ultra low noise Type IIs such as TDK *SA-X* than with high energy metals which the deck failed to make much more of than it did with chromes. Due to its low hiss levels, TDK *SA-X* also facilitated recording without Dolby noise reduction, whilst still turning in noise levels comparable to most decks with most tapes with Dolby C. I've even heard Dolby C installations

which were noisier in the extreme treble.

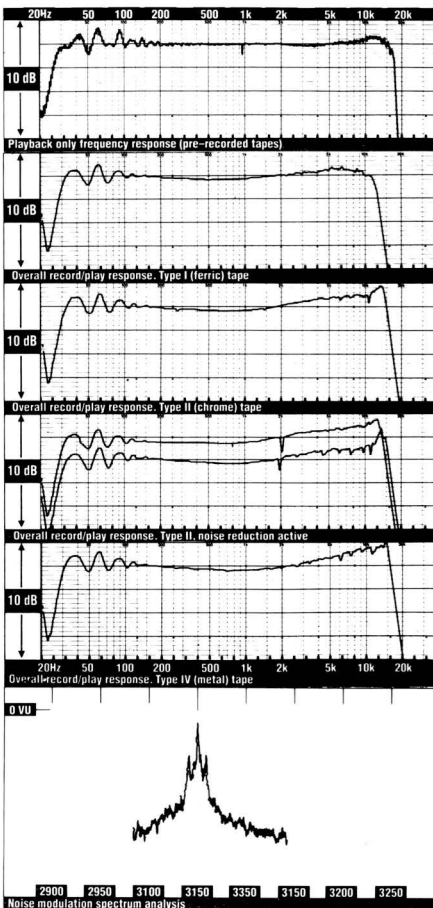
Prerecorded music also fared well due to the Technics' inherent stability and clarity, and the well adjusted response shape.

CONCLUSIONS

This is another first rate deck from the Technics stable, it's very similar to the *RS-B555* but a little more expensive and exactly specified. Paradoxically it also measures a little worse whilst sounding consistently more euphonious and musical, Best Buy.

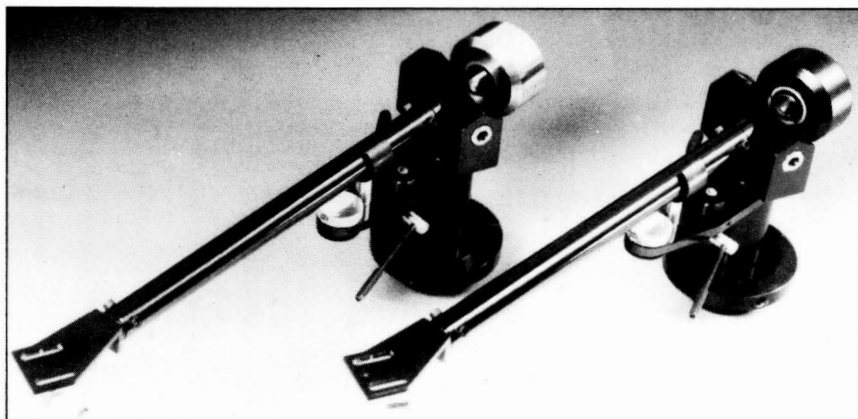
TEST RESULTS

Dolby Level reading on deck's meters	+2dB
Rec/replay response -3dB ref 1kHz	
IEC Type I	28Hz – 13kHz
IEC Type II	28Hz – 16kHz
IEC Type IV	28Hz – 17kHz
Wow & Flutter – Peak DIN wtd/unweighted	0.10%/0.17%
Wow/Flutter – Peak DIN wtd	0.06%/0.18%
Speed error	+0.2%
Type I signal/noise CCIR/ARM-400Hz & distortion 0VU	48.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	0.6%
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	54.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	0.4%
Type IV signal/noise CCIR/ARM 400Hz & distortion $+3\text{VU}$	54dB
Type IV signal/noise CCIR/ARM 400Hz & distortion $+3\text{VU}$	0.65%
Noise Figure of Merit (Dolby level/noise Type II)	56.5dB
Crosstalk + Noise ref $0\text{VU}/1\text{kHz}$	47.5dB
Line input sensitivity/overload	147mV/6.6V
Mic input sensitivity/overload	0.38mV/20mV
Line output for $0\text{dB}/\text{maximum}$	638mV/2.95V
IM distortion $10\text{kHz}/11\text{kHz}$ 0dB peak, 1kHz product	0.032%
Azimuth check R-L phase at 10kHz	60°
VU indication at IEC 0dB	4dB
Dimensions (w x h x d)	43 x 13.4 x 28cms
Average wind/rewind time (C90)	2mins 10secs/average
Typical retail price inc VAT	£200



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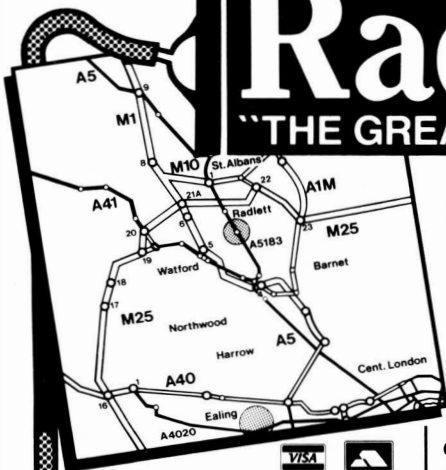
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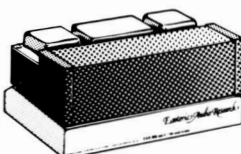
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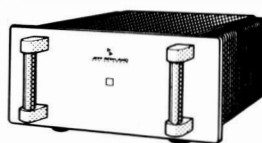
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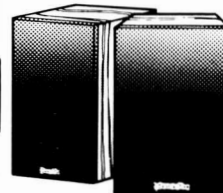
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TECHNICS RS-TR555

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RECOMMENDED



Technics is one of the market leaders in dual cassette decks and this is its most ambitious design at present, and a high priced one too given that dual decks mainly appeal at the budget end of the market. The *RS-TR555* however, is a genuine high fidelity deck which in audio terms should hold its own with some quite respectable single transport cassette decks. It also does everything you could possibly imagine, or just about.

How about this: both transports are identically equipped with quick acting optically triggered auto-reverse mechanisms; and both can record. In case you've forgotten your 90 times table, this means that you can make continuous recordings of up to three hours in length (using C90s), and you can also make two recordings from an external source simultaneously. Continuous (sequential) play is also available in the time honoured way, and tape to tape dubs can be performed at twice normal speed if you're not too worried about sound quality. The *TR555* can also be switched to continuous auto repeat when it will play for up to about 24 hours without intervention.

The list of features still to be described is scarcely less impressive. The deck has Dolby C and dbx (for what it's worth, which ain't a lot) noise reduction, plus Dolby HX Pro. The record level meters, which are necessarily rather short, have switchable ranges, from -3dB to +8dB or (more usefully) -20dB to +8dB, with a peak hold facility. Each transport has its own electronic tape counter, the remaining tape search aid being track search.

LAB REPORT

Most of the circuitry, power supply included, is contained on one large PCB, though the noise reduction circuitry with its complement of two Dolby and one dbx IC is mounted edgewise near the back. The deck is otherwise well made, using standard commercial grade components. Each of the two auto-reverse transports employs separate reel and capstan motors, though this doesn't eliminate rather protracted delays when winding tapes long distances.

The *RS-TR555* serves both to show what can be achieved within a modestly costed brief for a dual transport auto-reverse deck, and where some of the inevitable comprom-

ises are made. The basic frequency responses shown alongside are all pretty impressive, and might well have come from a single transport unidirectional model of good pedigree at this price without attracting adverse comment. Perhaps the LF is a little lacking in output, but the minor response errors at HF with Type I and IV tapes are just that - minor and in the end inconsequential. But the Dolby plots do show a progressive magnification of small errors, which become quite severe by the time we get to the dbx plot.

There is also some quite severe HF loss on recordings played back in the 'wrong' direction, ie the one opposite to the direction chosen when the recording was made (plots showing this effect are not reproduced for space reasons). This of course, is caused by cumulative head line-up (azimuth) errors. Relatively poor noise figures are offset by excellent headroom, and the available dynamic range is good, though with slightly less impressive results using metal tapes. Finally wow and flutter levels are extraordinarily good for an auto-reverse model.

SOUND QUALITY

This deck is essentially self-recommending. There are very few designs around offering a comparable range of functionality at the price, or at any price for that matter. Some compromises are expected and inevitable at this price level, and this deck had its share of them, along with the odd gimmick like dbx which sounded smeared, inconsistent and gave erratically modified stereo imagery. Thankfully, the *RS-TR555* was admirably restrained for the most part.

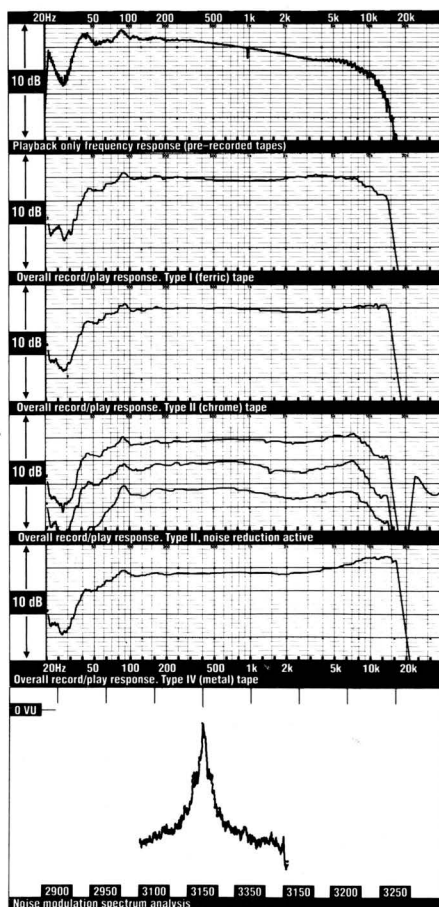
The compromises involved with a package of this complexity did show. The key finding was of a loss of detail and a smoothing and rounding of the craggy bits, in other words a loss of dynamics. I was impressed by the liveliness of recording on metal tapes, but good Type Is and IIs were more appropriate on value grounds as the outer limits of the performance envelope of metal tapes could not be reached by this recorder. Ferrics also suited well subject to a little extra rounding off of detail. However, the bass was a little thin with all tape types. Treble (and detail) losses tended to accumulate in reverse play mode.

CONCLUSIONS

Recommended with confidence, subject to the qualification that if you don't need the extra transport and auto reverse facility, you'll be better served by a good single transport model. After all, £300 may be good value for money for what's on offer but it isn't peanuts.

TEST RESULTS

Dolby Level reading on deck's meters	+5dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	38Hz - 15kHz
IEC Type II	35Hz - 15kHz
IEC Type IV	35Hz - 18kHz
Wow & Flutter - Peak DIN wtd/unweighted	
FWD: 0.10%/0.16%; REV: 0.08%/0.21%	
Wow/Flutter - Peak DIN wtd	
FWD: 0.06%/0.14%; REV: 0.06%/0.18%	
Speed error	+0.3%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	47.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	0.7%
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	52dB
Noise Figure of Merit (Dolby level/noise Type II)	52dB
Crosstalk + Noise ref 0VU/1kHz	0.55%
Line input sensitivity/overload	57dB
Mic input sensitivity/overload	45.5dB
Line output for 0dB/maximum	157mV/7.1V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	n/a
Azimuth check R-L phase at 10kHz	775mV/3.1V
	8.0%
	(1) FWD 40°/REV 60° (2) FWD 20°/REV 80°
VU indication at IEC 0dB	+8dB
Dimensions (w x h x d)	43 x 13.4 x 28cms
Average wind/rewind time (C90)	2mins 12secs/slow
Typical retail price inc VAT	£300



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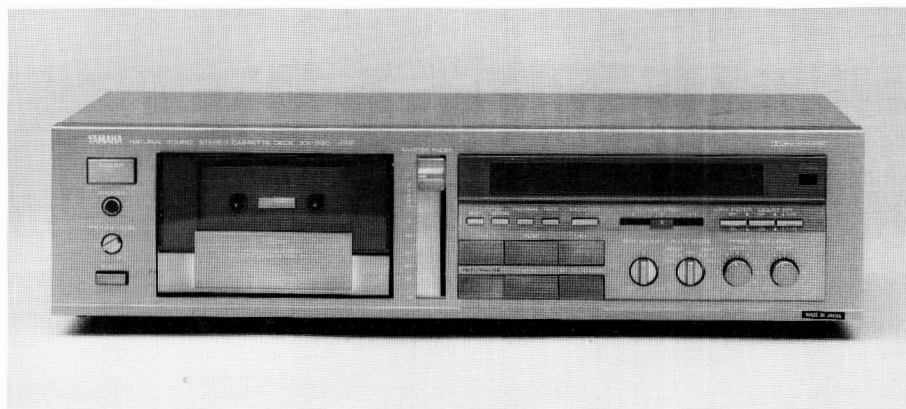
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RECOMMENDED



This attractive new deck from the extensive Yamaha stable is a three-head machine, capable of real time off-tape monitoring with an auto source/tape switchover. The standard Dolby noise reduction circuits are complemented by an MPX filter defeat switch and Dolby HX Pro. A fine bias control is fitted: it's effective with all tape types over a wide ± 20 per cent range. Input levels can be pre-balanced using a pair of rotary controls, with overall gain and in/out fades provided by a large and smooth running vertical master gain control. The meters are an impressive two-colour design in a backlit orange colour.

Tape play options include phrase (of arbitrary length) or full side repeat, and the tape counter has a choice of time and standard rolling number displays, with an optional tape remaining read-out a button push away if the tape length has been programmed into the Yamaha's logic circuits. Headphones are connected via a volume control.

The *KX-630* is dressed in a ravishing brushed silver grey, a few shades darker than you'd expect of aluminium. This is genuine metalwork rather than a cheap plastic substitute. White lettering sets the finish off beautifully, but for those who prefer their hi-fi boring (or to match the coal scuttle), this deck is also available in - wait for it! - black.

An infra-red remote control is available as an optional extra (not submitted), and adds a range of functions not otherwise accessible, including intro-scan, direct track access and random (memory) play of up to eight selections. The IR receiver is prefitted.

LAB REPORT

The power supply electronics are housed on a dedicated PC board, along with the transformer, which appears to have separate windings for the audio circuits. Board layout is extremely rational, with all circuit blocks carefully identified.

The playback head is a 12 layer laminated amorphous design coupled to a DC playback amplifier which appears to be of good design. The transport makes good use of precision diecastings, and has separate reel drive and capstan motors. It engages and dumps transport modes unusually quietly.

I measured nearly an octave difference in HF response between ferric and metal tapes, which is extraordinary by any standards,

especially where, as here, the former isn't depressed, nor the latter buoyed up by incorrect biasing. The Type II chrome result splits the difference. All responses, even the playback only one, are flat or nearly so, and well extended into the bass, with head contour effects largely minimised. Tape winding speeds however are slow. The Yamaha's electronics allow plenty of headroom to help make the best of the intrinsically more energetic and less compressed sounding metal tape formulations. Wow and flutter levels however, are borderline for a deck at this price level.

SOUND QUALITY

The wow and flutter figures didn't intrude and I was extremely impressed by this deck which with metal tapes is one of the most accurate and musical recorders I have recently come across, and a real improvement on certain good players at higher prices. Apart from a slight loss of harmonic richness and warmth when driven very hard, and a faint background 'glow' of low frequency system noise, recordings made using good tapes scarcely betrayed the fact that they were just cassette recordings.

This said, the Yamaha joins a growing band of new high performance decks which are stretching the once subtle differences between the three tape groups, and this is despite the presence of Dolby HX Pro which in effect exists to close the gap with metals with their reduced susceptibility to self-biasing. In fact, performance fell off in direct proportion to the reduction in bias requirements, with lowly (but good) ferrics demonstrating clear losses of openness and stereo precision, especially around the straight ahead position. Another notable factor was the well recognised if poorly understood precedence effect whereby the loudest instrument in a mix tended to overwhelm and modulate the others. With metal tapes, it was much easier to follow quiet, subtly played strands, and soundstaging had a more solid, tangible quality.

Dolby C proved highly acceptable with this recorder: any degradation caused by the circuit over and above the losses incurred with Dolby B were lost in the extra noise present with the latter. The same applied when comparing Dolby B to the situation prevailing

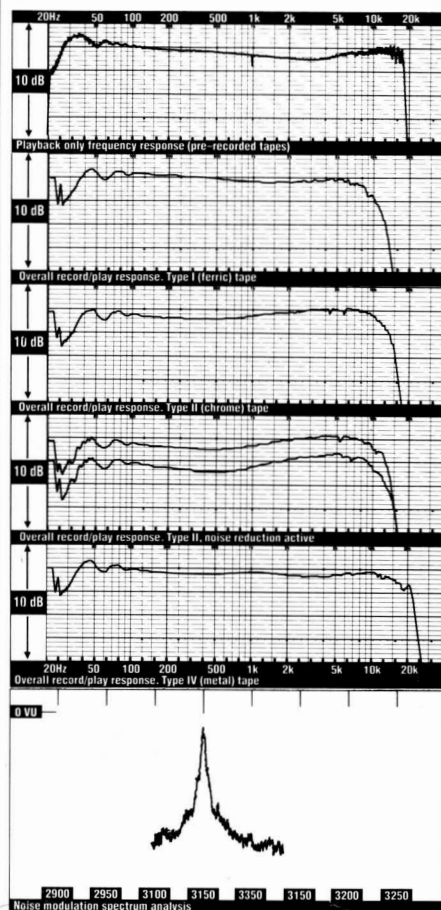
with the noise reduction circuit switched off.

CONCLUSIONS

By any standards, this is an exciting deck to operate. The range of features is wide and impressive, if slightly daunting at first, and the new colour scheme is a refreshing change. To this, the performance standard of this deck overcomes the slightly wayward quality of some earlier Yamahas. Recommended, with only price standing in the way of a Best Buy ranking.

TEST RESULTS

Dolby Level reading on deck's meters	+0.5dB
Rec/replay response - 3dB ref 1kHz	
IEC Type I	<20Hz - 12kHz
IEC Type II	<20Hz - 15kHz
IEC Type IV	<20Hz - 21.5kHz
Wow & Flutter - Peak DIN wtd/unweighted	0.14%/0.22%
Wow/Flutter - Peak DIN wtd	0.09%/0.20%
Speed error	-0.4%
Type I signal/noise CCIR/ARM 400Hz & distortion 0VU	49.5dB
Type II signal/noise CCIR/ARM 400Hz & distortion 0VU	55dB
Type IV signal/noise CCIR/ARM 400Hz & distortion +3VU	56dB
Noise Figure of Merit (Dolby level/noise Type II)	55.5dB
Crosstalk + Noise ref 0VU/1kHz	52dB
Line input sensitivity/overload	107mV/>13V
Mic input sensitivity/overload	n/a
Line output for 0dB/maximum	593mV/3.65V
IM distortion 10kHz/11kHz 0dB peak, 1kHz product	4.0%
Azimuth check R-L phase at 10kHz	15°
VU indication at IEC 0dB	2dB
Dimensions (w x h x d)	43.5 x 11.8 x 27cms
Average wind/rewind time (C90)	2mins 18secs/slow
Typical retail price inc VAT	£300



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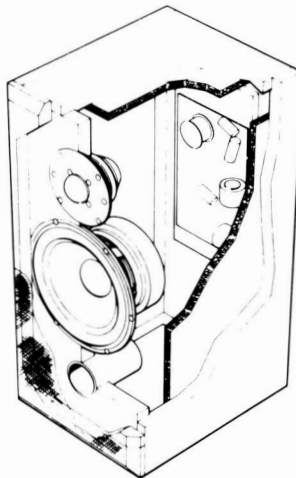
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TECH TALK

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 Chris Bryant, who did the sensitivity, overload, azimuth, intermodulation and VU indication at IEC 0dB measurements. All the remaining machine tests and 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; errors cancel out on replay.

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.

Noise 'Figure of Merit' like signal/noise but referred to as constant magnetisation level, ie Dolby level Type II tape used.

Channel separation is measured with reference to a 1kHz signal at 0VU on the deck's meters – and includes noise. 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. Average wind/rewind time is timed in both directions using a C90.

Dimensions (w x h x d). These are measured 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 these tests, 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 were 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 *CD94II* CD player, QED *A270* and *C300/P300* amplifiers, 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 Threshold preamplifiers, Musical Fidelity *A370/II* and Threshold power amplifiers, a Roksan/*Artemiz/Shiraz* record player, the Marantz CD player already mentioned and Apogee *Caliper* loudspeakers, all wired with solid core cable from DNM and Mission.

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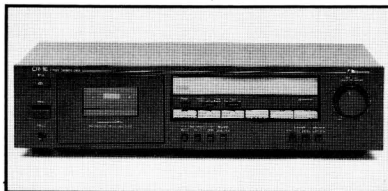
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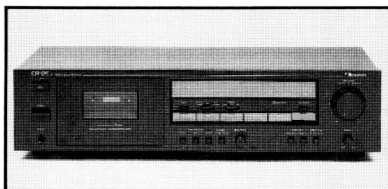
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CASSETTE DECKS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Alvin collects his thoughts together and brings you the lowdown on this month's batch of tape decks.

The last year or so has seen the cassette deck come of age, in much the same way as the car industry did a few years ago when the market suddenly switched from wallowing Cortinas to the likes of sharp handling Cavaliers. But the steps that have brought this maturing process to fruition have been evolutionary rather than revolutionary. Few of the manufacturers represented seem willing to stick their necks above the parapet and take a chance. But then they would probably reply that the climate isn't right for taking chances. The decline of DAT – the future that never happened – has effectively removed what pressure there was.

But changes there are if you look for them. There's a general drift towards including Dolby HX Pro, which is now almost ubiquitous, and many decks now offer a powerful range of tape search aids aping those now common on CD players. The role of electronics in managing the 'front ends' of these products is proliferating, but is sometimes taken to preposterous extremes. Witness for example Denon's electronic Dolby switching that suffers instant amnesia the moment the machine is switched off.

On the whole, though, cassette decks are becoming easier to use, tapes easier to search and performance standards slowly but perceptibly rising, especially in once vexed areas like high frequency saturation performance and bass clarity. One reason is that manufacturers are increasingly using as a technical yardstick the ability to dub a CD without sounding silly. I also noticed a distinct improvement in setting up standards this year so matching tape to machine is no longer quite as arbitrary as it once was.

Encouragingly, there has been no wholesale shift to auto-

reverse or twin decks, rather the market for straightforward but quite highly specified decks, typically boasting three heads and twin capstan transports, seems to be ever more active.

This should be the last year in which the slowly unfolding status quo I've described will continue. Late this year we should begin to see the first Dolby S equipped cassette decks. This is not the time or place to pre-judge this new system, but merely to note that it is being billed as a technical 'fix' which renders DAT sonically redundant. Needless to say, we will keep you informed...

RECOMMENDATIONS

Just three of the decks tested ended up with Best Buy commendations, and two were from Technics. Of course a number of much better decks were excluded on grounds of cost: Best Buys are restricted to products that sit well on the steep lower slopes of the 'diminishing returns' curve.

The Technics *RS-B555*, which at £160 is the cheaper of our two Best Buys, is built to a standard that belies the price. This well equipped if slightly fussy design is extremely well set up, and – unusually for such a low cost deck – is perfectly capable of being used without noise reduction at all, given tapes that are electrically quiet enough. In practice this means the best of the Type IIs. A variable bias control means there are no unnecessary restrictions on choice of tape brand. The deck can sound slightly clinical at times, a little like a tape version of a CD player, but the heart is there, and in the final analysis the *555* is less flawed than most at the price.

The other Technics model to achieve Best Buy status is the *RS-B655*, costing £200. This is a model for all seasons. It looks and indeed is a great deal of cassette

deck for the money. In fact few of the frills add much of real value, and the first impressions are of a deck which flies rather too many kites to be taken entirely seriously. However, the *RS-B655* is backed by solid engineering, including a stable transport, accurate frequency responses and well designed electronics. The result is a very tidy package which performs excellently, especially when used without noise reduction and with an intrinsically quiet Type II tape – TDK *SA-X* for example.

The Pioneer *CT-445* (£180) has only one idiosyncrasy: manual tape type selection (move over Rotel!). Otherwise it's just a well engineered, lively sounding recorder, which is reasonably priced and earns Best Buy status.

Each of the remaining decks, listed in price ascending order, are straight Recommendations. The Rotel *RD-845* (£130) is an interestingly inconsistent product. The controls and displays are strictly functional, and it isn't particularly well adjusted for prerecorded tapes or metals. With a good Type II though, it's magic. Make sure you hear it first.

Much the same applies with the Marantz *SD-50* (£220) which has oddball aesthetics, but is well equipped and exactly engineered.

The similarly priced Denon *DRM-700* and the only slightly costlier Kenwood *KX-4520* – £240 and £260 respectively – are the first of our Recommended three-head recorders. They provide all the technical advantages and confidence that come with dedicated record and play heads and the ability to monitor whilst recording. Additionally the Kenwood boasts a very effective auto bias alignment circuit. The Denon has a less than wholly successful set of controls (see test – there's quite a list) but it

works brilliantly except with prerecorded material. The Kenwood is more mainstream in its appeal and also works well, but Dolby tracking could be better.

Slightly further up the price ladder, two models proved particularly attractive: the Yamaha *KX-630* (£300) and the Marantz *SD-60* (£350). As well as being cheaper, the Yamaha is particularly appealing with its classy metallic finish and some excellent tape search facilities, including the best tape counter in the group. The Marantz is even better equipped on the whole, though the controls are small and styling is best described as odd. On audition this is a truly high grade deck, but it only gives of its best with metal tapes, which is both a strength and a weakness.

The most costly member of this month's group, the Sony *TC-K730ES* (£500), provides a reasonable minimum of rather conservatively designed features but with some superb materials and construction ideas. One of the most unusual aspects of the Sony is that the transport and power supply have been placed amidstships which provides unusual standards of mechanical stability, and gives electrical isolation of the audio circuits from internally generated RF. This deck is close to pushing the boundaries of the state of the art, and in these terms is not over priced.

Finally, one model stands on its own. The Technics *RS-TR555* is a thoroughly satisfactory deck with two transports, both equipped with optically triggered auto reverse mechanisms and the ability to record. For a twin deck machine there's a marked absence of needless complication (the musically inconsistent dbx noise reduction circuit being the only important exception), and on the whole this deck is a surprisingly competent recorder.



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AUDIOPHILE RECORDINGS

In conjunction with hi-fi distributor Audiofreaks, Hi-Fi Choice can now offer its readers a selection of hard-to-find audiophile records and CDs.

Thanks to an exclusive deal with Audiofreaks, *Choice* has now sourced a variety of high quality Norwegian jazz recordings which are superb hi-fi demonstration records – plus the fabulous *Paganiniana* recording by Water Lily Acoustics of America, sponsored by Conrad-Johnson. As we find more good discs, we hope to add them to the list.

You might stumble across one or two of these records in some specialist hi-fi shops, but for the most part these albums are not readily available in the UK. You certainly won't find them in your local record store! So we are delighted to be able to make them available to *Choice* readers by mail order. We're sure you will enjoy them.

Please note: two of the discs – the Gemini and Odin samplers – are available only on Compact Disc.

RADKA TONEFF: Fairytale

CD: Odin CD03

LP: Odin LP03

The well known audiophile (digital) recording of female voice and piano. An international best seller, despite having been only sporadically available in this country. Enchanting songs.

ODIN SAMPLER

CD: NJ-4028-2

The Odin record label was established by the Norwegian Jazz Federation in 1981. This 75-minute compilation on CD provides a comprehensive taster from the label's catalogue. Not available on vinyl.

GEMINI/TAURUS SAMPLER

CD: GMCD 6239

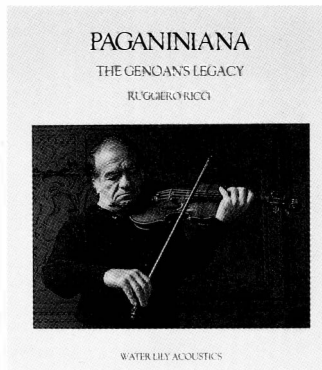
A pure jazz label, Gemini Records was formed by producer Bjorn Petersen to record Norwegian jazz musicians who deserve wider recognition. Taurus is a subsidiary label presenting less mainstream music. This 15-track sampler is available only on CD.

SMITH/RICCI: Paganiniana

CD: CJCD

LP: CJLP

Breathtaking, purist analogue audiophile recording of classical works performed on piano and violin. On the Water Lily Acoustics label, sponsored by Conrad-Johnson and imported from



America. An essential addition to any audiophile's record collection.

TOTTI BERGH: I Hear A Rhapsody

CD: GMCD 48

LP: GMLP 48

On the Gemini label, saxophonist Totti Bergh plays a selection of jazz standards. *Jazz Journal* magazine described this as "A delightful 'wee small hours' album."

LAILA DALSETH: A Time For Love

CD: GMCD 51

LP: GMLP 51

Another recording from the Gemini catalogue, this time featuring the golden voice of Laila Dalseth – with Red Mitchell on string bass.

FLIP PHILIPS/KENNY DAVERN/BJARNE NEREM: Mood Indigo

CD: GMCD 59

LP: GMLP 59

Excellent mainstream playing by three great gentlemen of jazz. Recorded during the 1987 Oslo jazz festival.

BJORN JOHANSEN: Take One

CD: NJ4021-2

LP: NJ4021-1

Norway's top tenor sax player and his dream band, recorded in a one-night session at Rainbow studios in Oslo. Featuring Cedar Walton, David Williams and Billy Higgins.

JON EBERSON: Stash

CD: Odin CD19

LP: Odin LP19

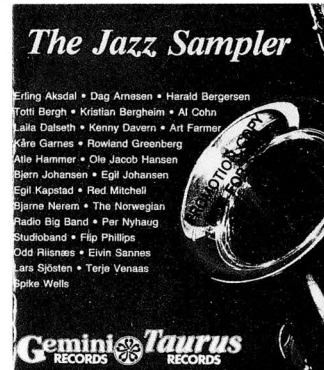
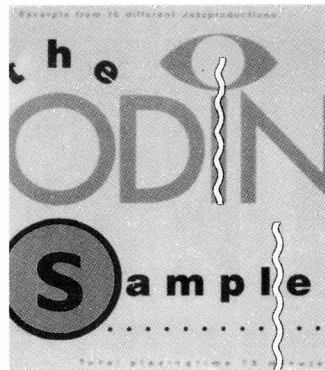
An exciting trio session with one of Norway's top guitarists. Featuring Terje Rypdal's rhythm section Bjorn Kjellemyr (bass) and Audun Kleive (drums).

CALEDONIA JAZZBAND: Walkin'

CD: HCRC 38

LP: HCRLP 38

Genuine New Orleans jazz/calypso/R&B/marching band with Wendell Brunious in the frontline on trumpet.



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1 LP Odin LP03 (£12.95)

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2 CD NJ-4028-2 (£14.95)

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3 CD GMCD 6239 (£14.95)

Totti Bergh: *I Hear A Rhapsody*

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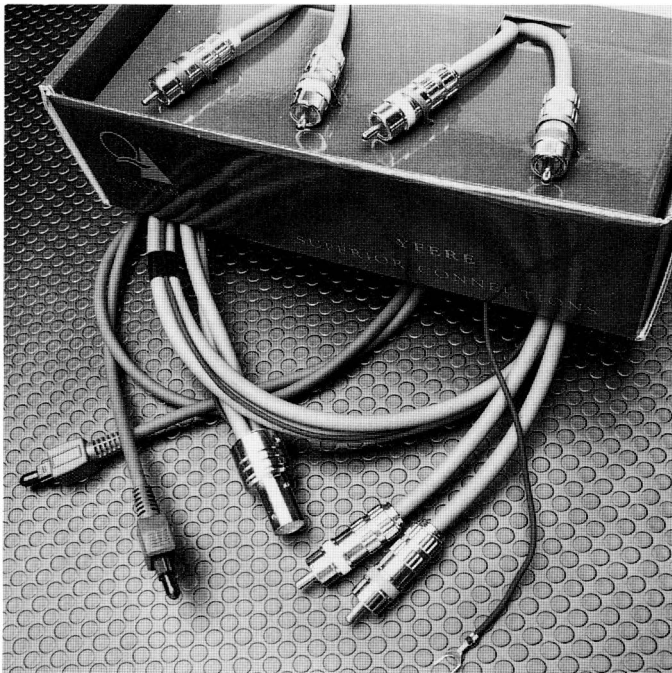
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GLOSSARY

The Hi-Fi Choice dictionary of audio terminology, explaining all the weird and wonderful adjectives used by our reviewers, as well as technical abbreviations.

AM: Amplitude modulated; see 'Medium Wave'.

ACOUSTIC BREAKTHROUGH: Sound that gets into the turntable and hence the cartridge from the air and thereby creates a risk of acoustic feedback.

ACOUSTIC FEEDBACK: If any sound in the room can find its way through the body of the record deck to the cartridge stylus, then that sound will be reproduced from the loudspeakers, along with the wanted programme material. If too much of this sound from the loudspeakers is picked up by the cartridge in this way then a vicious circle of acoustic feedback will be created.

ACTIVE: Speaker systems which contain electronic crossovers and where the drive units are connected directly to power amplifiers.

ALIGNMENT PROTRACTOR: A device used to minimise the lateral tracking error of a cartridge/arm combination.

AMPLITUDE: Size or magnitude; hence the amplitude/frequency response, known normally simply as the frequency response, which describes the relative loudness of the system at different frequencies with a constant input voltage.

ANECHOIC: Without echo; a special room or 'chamber' with thick sound absorbing materials on all surfaces to prevent reflections.

ARM MASS: More accurately called *effective* arm mass, because it is *not* the weight of the arm on a pair of scales. It is the mass of the arm and cartridge combination that appears to be concentrated at, and thus felt by, the stylus tip which is tracking a record groove. There is nothing inherently good or bad about arms with light or heavy effective mass; what matters is the manner and choice of their combination with cartridges of different compliance and the low frequency resonance produced by such combination.

AZIMUTH: With reference to tape and cassette recorders, the alignment of head gap to tape path.

BALANCE: 1) The overall relative loudness perceived at different frequencies (eg bass, treble); 2) the accuracy of the match between the two channels of a stereo transducer (eg cartridge or pair of loudspeakers).

BANDWIDTH: A range of frequencies with presumed defined upper and lower limits.

BASS: Lower part of the frequency spectrum.

BELT DRIVE: The motor has its rotational speed geared down to the required platter speed (33 $\frac{1}{3}$ rpm for LP discs) by a rubber or similar resilient belt which runs round a small pulley on the motor shaft and a large pulley attached to or part of the platter.

BEXTRENE: A plastics material frequently used for bass and mid-range cones.

BIAS: (*turntable/arms*) Because the cartridge on a pivotal arm is being drawn across the record surface by the stylus tracking at an angle offset from the pivots, groove friction produces an imbalance of lateral force. Bias is the application of a compensatory lateral force acting in the opposite direction.

BIAS: (*tape*) This refers to a high frequency current passing through the record head which allows the audio current also passing through the head to produce reasonably linear magnetisation of the tape at all levels permitted by the combina-

tion of each machine with the tape. The lowest level of bias is required for ferric cassettes, a slightly higher one for ferrichrome, an even higher one for chrome or pseudochrome, and the highest for metal.

BOTTOMING: The stylus scraping on the distorted rounded bottom of the groove due to incorrect stylus geometry.

CANTILEVER: The thin rod or tube that connects the stylus to the armature and hence the cartridge body.

CAPACITANCE: An element of electrical impedance that is particularly important when matching pickup cartridge, arm leads and amplifier input characteristics to achieve a flat frequency response from discs.

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 interconnected component; of importance in compatibility of cartridge/amp, and amp/headphone.

'LOUDNESS': An equalisation circuit frequency switchable on amplifiers which is designed to compensate for presumed hearing characteristics at low listening levels by boosting bass and treble.

MOL: Maximum operating level of tape normally referring to 5% distortion of 315Hz or 3.15kHz.

MEDIUM WAVE: An AM transmission band incapable of high fidelity signals.

MICRO-(μ): Prefix for units meaning one millionth of.

MICROSECONDS (μ s): The time constant of a resistor capacitor combination involving a frequency response change (equalisation).

MIDRANGE, MIDBAND: The central part of the audible frequency range where the ear is most sensitive.

MILLI-(m): Prefix for units meaning one thousandth of.

MODULATION: The audio signal is 'stored' by means of modulations within a medium, eg the 'wiggles' in the groove of a plastic disc, or the

magnetic coding on a tape.

MODULATION NOISE: An additional noise added to tape noise, which increases with the degree of modulation of the tape, caused by the properties of the magnetic coating. This noise has most of its energy near the modulation frequency (causatory tone).

MOVING COIL: A transducer (eg cartridge or headphone) where the signal is generated by the movement of a coil within a magnetic field.

MOVING MAGNET: The most common form of cartridge transduction, where the magnet moves while the coils are held relatively stationary.

MULTIPLY 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 *cross-talk*.

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.

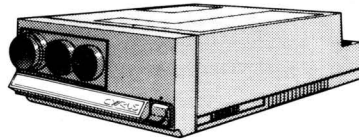
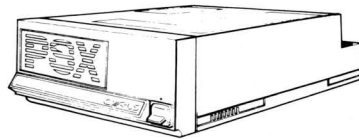
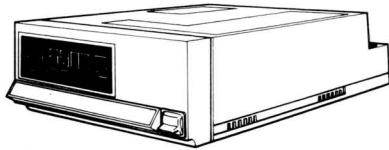
WEIGHTING: A factor or function that is applied to a measurement to increase its relevance and usefulness.

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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SUGGESTED SYSTEMS

Amps	Speakers								
	Wharfedale Delta 30 JPW Minim	JPW Sonata Wharfedale Diamond 3	Celestion 3	Mission 761 Heybrook Point 5 Tannoy E11 JPW Sonata+	Celestion DL 411	B&W DM550 Celestion DL6 11 Allison AL105	Tannoy M15 Infinity RS2001 Widale 505.2	Heybrook HBI Celestion DL 811 Mission 762 Allison AL110 MF Reference 2	Tannoy M20
Arcam Alpha II	308.95	327.95	337.95	356.95	367.95	387.95	402.95	417.95	457.95
Denon PMA 250	258.95	276.95	285.95	293.95	310.95	323.95	344.95	361.95	386.95
Denon DRA 325R	402.95	420.95	429.95	436.95	453.95	462.95	486.95	512.95	529.95
NAD 7020E RECV	338.95	358.95	368.95	378.95	388.95	398.95	428.95	438.95	468.95
NAD 3020i	273.95	291.95	301.95	314.95	326.95	333.95	354.95	371.95	409.95
NAD 3240PE	343.95	360.95	368.95	385.95	393.95	402.95	428.95	445.95	470.95
NAD 3225PE	289.95	298.95	307.95	314.95	331.95	340.95	366.95	382.95	426.95
Rotel RA 810A	257.95	264.95	274.95	291.95	308.95	316.95	333.95	359.95	384.95
Rotel RA 820AX	281.95	299.95	308.95	315.95	332.95	341.95	357.95	383.95	407.95
Rotel RA 820BX+	315.95	333.95	342.95	349.95	366.95	375.95	382.95	408.95	476.95
Rotel RA 840BX+	357.95	375.95	384.95	391.95	412.95	417.95	433.95	457.95	519.95
Rotel RA 870BX	443.95	461.95	470.95	488.95	505.95	513.95	530.95	556.95	601.95
Yamaha AX330E	263.95	281.95	290.95	298.95	316.95	323.95	344.95	361.95	386.95
MF BI	353.95	370.95	378.95	387.95	403.95	420.95	438.95	455.95	481.95

All systems come with Dual CS 430

BARTLETTS

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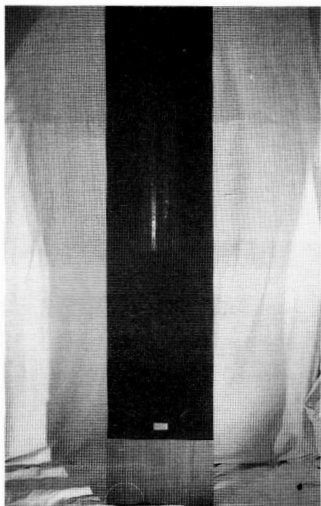
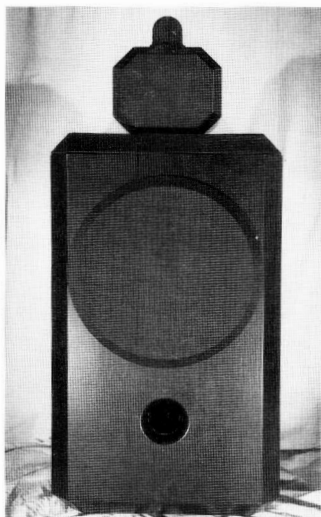
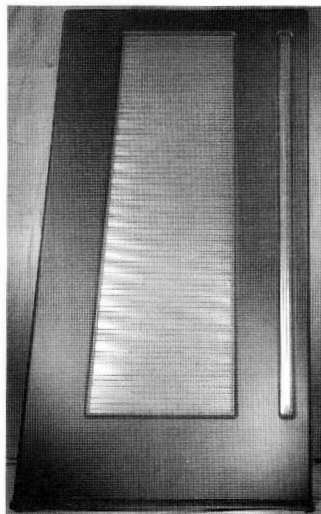
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E & O E



CHOOSING AND USING . . . BIG LOUDSPEAKERS

Paul Messenger gives some sound advice on the pleasures and problems of cohabiting with large loudspeakers.



The term 'big loudspeaker' could cover a wide range of sizes, but the common factor is that living with a pair will be an intrusive and somewhat demanding experience. But if you want to put some genuine welly and scale into your music reproduction, or seek the transparency and stereophony that only a panel speaker can provide, there's no alternative, and if you get the whole mixture right it can be really worthwhile.

But be under no illusion, getting it right is much more difficult than with the standard bookshelf model sitting on its open frame stand. 'The wider you open the window, the more the muck blows in' is one of hi-fi's fundamental aphorisms, usually attributed to the late Gilbert Briggs, founder of Wharfedale. The signal quality that suffices for the small loudspeaker is often completely inadequate to do justice to a full range floorstanding model with state of the art aspirations.

Besides a first class driving system, big loudspeakers ought really to be given big rooms to work in – 20ft by 15ft is a sensible minimum. Of course, big means expensive too, but that in turn frees the designer from the stereotype six-sided box. Many will be funny shaped floorstanding models, and where stands are used these will be dedicated to, or integrated with the model concerned.

Freed from price constraints, variety becomes the rule rather than the exception. Wide variations in acoustic performance in particular provides a wealth of choice denied the mass market. Monopoles (box loudspeakers) behave quite differently from dipoles (panels), and therefore give a quite different hi-fi experience.

With few exceptions, the siting in the room will be largely determined by the loudspeaker itself. Or to put it a more practical way round, the room shape, furniture layout, position of doorways, windows, fireplaces and so on will all tend to determine where the speakers



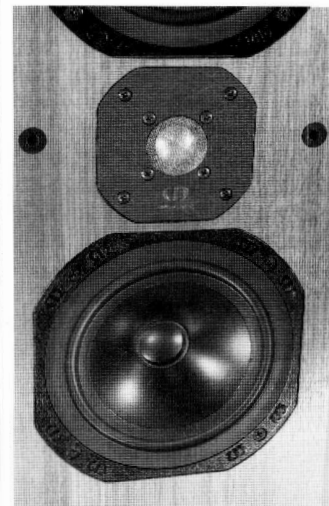
have to go, and this in turn will whittle down the list of suitable candidates.

Some big speakers can be mounted close to a wall, but the majority – and especially the panel types – seek to provide the stereo precision that is best achieved a metre or more from reflective surfaces. Do experiment with position, because this can make a big difference to the sound balance and stereo performance. And when the right acoustic performance is obtained, make sure the spikes are properly tightened with lock-nuts, so that optimum mechanical performance is ensured.

Those investing in genuine bass excavators (which tends to exclude the panels) should also make sure the floor is solid enough, and any loose floorboards nailed down. Final tweaking can be done by ringing the changes with cables and bi-/tri-wiring, while bi-/tri-amping

Tested this month (clockwise from top left): Apogee, Mission, Monitor Audio, SD Acoustics and B&W.

(using separate power amplifiers to drive each of the terminal pairs provided) often will be well worth investigating in cost-no-object systems.



APOGEE CALIPER SIGNATURE

ABSOLUTE SOUNDS LTD., 318 WORPLE ROAD, LONDON SW20 8QU. TEL: (01) 947 8160.

I can still vividly remember my first encounter with Apogee loudspeakers. It was with *Scintillas* – indeed the first *Scintillas* to cross the Atlantic. One had suffered the indignity of a foot through the bottom of the main ribbon during unpacking, but they nevertheless sounded absolutely gorgeous, combining much of the positive attributes of my two favourite loudspeakers – the bass weight and extension of the Linn *Isobarik* with the transparency and imaging of the Quad *Electrostatic*.

The one factor that dissuaded me from entering into serious financial negotiations with Absolute Sounds was that a changeover would have required the amplifiers to be changed as well as the speakers, and I admit that the fragility of the naked ribbons worried me, in the context of an environment that was then liberally sprinkled with toddlers.

It must be half a dozen years later that I finally managed to get a pair of Apogees into the house for some serious listening, and even though this is the 'smaller' *Caliper Signature* model, remarkably little appears to have changed, which is some testament to the basic rectitude of the design. One improvement I'm pleased to note is that a transparent and virtually invisible fixed open weave nylon grille now protects the ribbon surfaces from inquisitive digits.

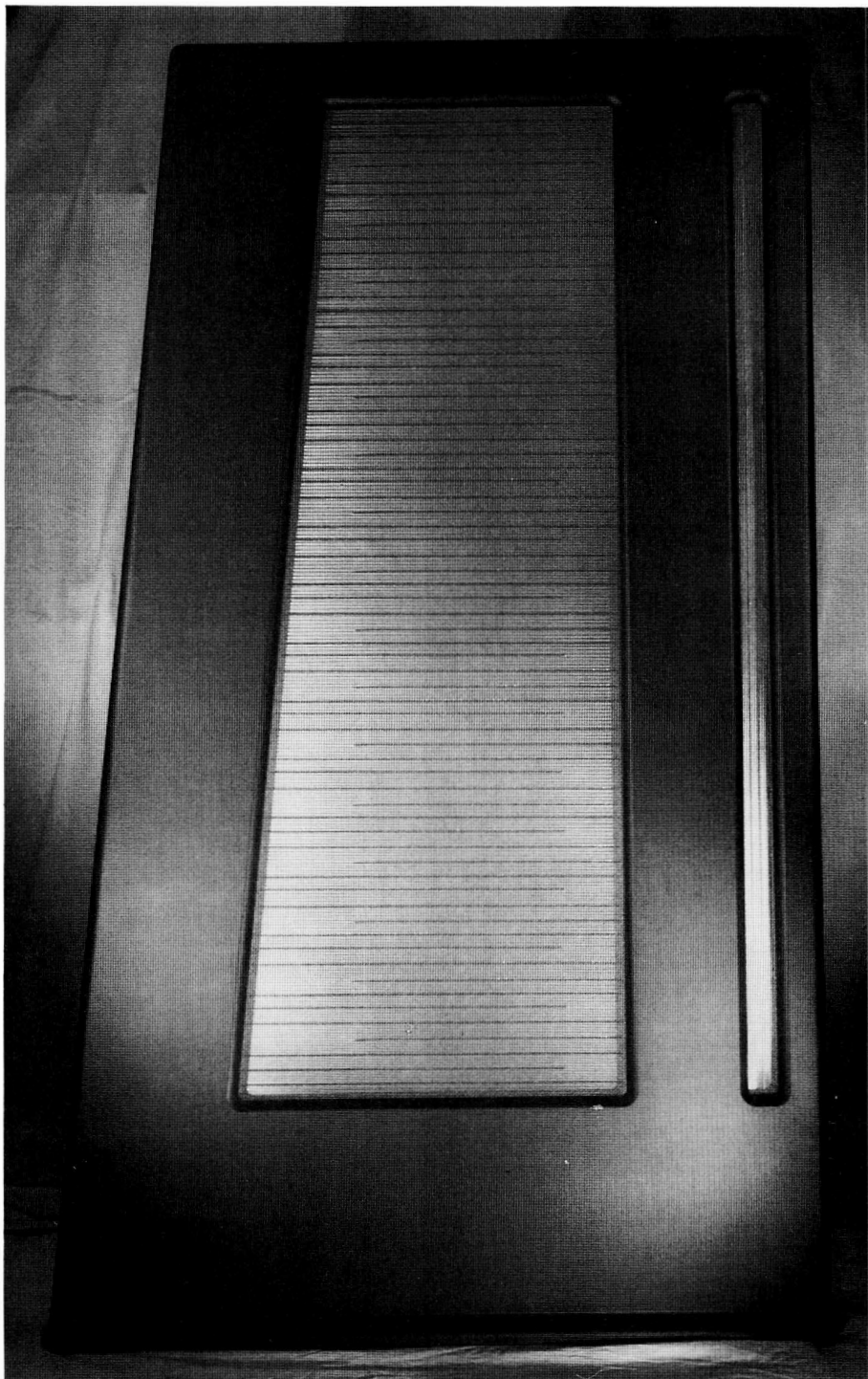
Like all Apogees, the *CS* is a full range ribbon. Which means it's significantly different from virtually every other loudspeaker on the market, and certainly all the models in this group. Until the recent introduction of a new *Stage* model, the £3,150 *CS* was the least costly(!) in a four model range that goes up to (and beyond) the £8,600, c2m high *Diva*. Apogee is about substantial personal discretionary spending, even before considering the partnering amplification, which is the same ballgame all over again (see later).

A ribbon loudspeaker is a species of panel loudspeaker, and as such behaves very differently from the more conventional box loudspeaker. Panels operate as dipoles, radiating equally but with opposite phase on front and rear faces. They therefore need to be sited well away from the wall behind to avoid the anti-phase reflections interfering with the front radiation, especially at low frequencies.

Probably the best place for a panel is actually as a sort of room divide, about a third to halfway down a long room, angled slightly inwards to take advantage of the fact that the output (sideways) in the plane of the panel is nulled by cancellations, so sidewall reflections may be minimised. In fact Apogee suggests 1m from the rear wall, about 2m apart with only the slightest toe-in, and this suited the listening room well.

Although factors such as diaphragm area play a part, the real limiting factor in the bass extension of a dipole panel is its size. The baffle dimensions determine the longest wavelength (and hence lowest frequency) the speaker can radiate before front and rear outputs cancel.

In this respect the *Caliper* is probably a



good compromise for largish UK rooms. Its 60-70cm width and 1.2m height are far from small, but are elegantly crafted and capable of generating good room output down to c30Hz – no gut-wrenching subsonics, but good extension by any normal standards.

The characteristic of the dipole panel (as opposed to the monopole box loudspeaker) is that it uses a very large but very light diaphragm. It's not rigid like a speaker cone, but doesn't need to be since the panel is 'area-driven' – all (or most) points of the surface are individually motor driven, and there's no enclosure to pressurise. The large

area only needs to make small movements to get the same effect as a small cone. Panel damping techniques are their own art form, but the light diaphragm is at least partly controlled by the air molecules themselves.

Where the monopole naturally tends towards omni-directionality, with the drivers behaving as point sources over much of their working bands, the much larger diaphragm area means that the dipole has an exasperating tendency to 'beam' higher frequencies in a particular direction, both vertically and horizontally, which can severely restrict the listening area. The payoff lies in sheer coher-

ence of the panel-generated signal, which usually provides considerable stereophonic detail.

If the solution to deep dipole bass is a fat baffle, the solution to good dipole treble is a tall slim panel that acts as a narrow line source to give good lateral distribution and fine consistency at various different heights.

This is much what Apogee has done, the limitations with the Caliper being that the ribbon height is less than a metre, which still leaves constraints for a six-footer like yours truly who also likes to lie on the floor (when not forced to do so by a recalcitrant spinal column). The combination of floorstanding with the gentle backward tilt is a good attempt to cover as much of the room space as possible, but I suspect I'd only be really happy with *Divas*.

Another compromise is that in order to get the height, the bass/mid and mid/treble drive panels have to be set side by side, with several inches between their acoustic centres. Inevitably images are going to be slightly 'spread' and 'overwide'. The solution would be to bracket a centre treble ribbon with two bass panels, in the manner of the original Quad.

What distinguishes the Apogees from other electrodynamic dipoles like Maggies, or the Quad and other electrostatics, is the use of the ribbon drive system. This is like taking just the motor parts of a moving-coil driver – the voice coil and the magnet – and reshaping them so the coil becomes a series of flat foil strips, sitting in a magnetic field created over the whole area by many bar magnets.

The 'voice-coil' becomes the actual driving panel, which is about as purist as you can get, while still (theoretically) maintaining (or even improving on, thanks to better damping) the amplifier drive characteristics of the normal cone driver. I practice, in a desperate quest for sensitivity and efficiency the latter tends to go out the window (see later).

Each *CS* weighs a doughty 42kg on my bathroom scales, evidence of the amount of permanent magnet that's built into its slim and elegant frame. The shape, sculpturing, textured finish and even the visible reflective ribbon itself all create a decidedly contemporary 'high tech' impression. As a design statement it works very well, but looked a little distressed amongst my Edwardiana, and was clearly looking forward to moving to a post-Bauhaus environment.

I made no attempt to dismantle these speakers, simply because I had no idea where to start and was odds-on to making a real pig's ear out of some very expensive hi-fi. I am going to gripe a little about the support, which consists of two studs (not spikes) along the lower panel edge plus a couple of rather flimsy brackets with adjustable spikes (no lock-nut) for height adjustment, secured by silly little wood screws that had long ago stopped biting into the wood frame of my well-travelled demonstrators. Six broken matches later all was up and running, but for three grand some improvement might be in order.

In other respects the loudspeakers were very well finished and presented, though I did wonder whether the perforated rear panel might not have been more securely fixed within the frame. Twin terminals allow

bi-wire or bi-amp operation, and Apogee also makes a *DAX* electronic crossover for full active operation (at an extra five grand or so, without power amps!)

TEST REPORT

The fact that the *Caliper Signature* is totally different from conventional box loudspeakers is clearly shown in the measurements. Indeed, I don't know whether to start with the good news or the bad, for both are fairly dramatic.

The name *Caliper* implies a measurement instrument, and is well chosen; at times I was unsure whether I was measuring it or it was measuring my test gear (probably a bit of both). The in-room response is both impressively flat and unusually smooth throughout the range, with any unevenness significantly better controlled than normal. The crossover actually occurs around 600Hz-1kHz, though the transition appears entirely seamless.

The bad news is that sensitivity is c81dB/W the lowest I've come across for a long time, compounded by the fact that the impedance is a barely tolerable 30ohms or thereabouts throughout. In fact the low impedance turns the 2.83V-driven 'Watt' of the rating into nearer 3W, current demands being three times those of a normal 8ohm load, so even 81dB is something of an exaggeration, albeit offset to a degree in the far field due to the line-source drive. To exploit the *Caliper's* capabilities will therefore require massive high quality amplification (itself possibly a contradiction in terms!).

I couldn't resist the temptation to compare the *Calipers* with my old Quad *Electrostatics*, which give nearly 5dB greater output across most of the audio spectrum for the same voltage input, though the *Caliper* has nearly an octave extra LF extension. Indeed its LF extension to below 30Hz is very creditable, though below this cut-off point you get absolutely sweet FA with such a design, so it doesn't qualify for a bass excavator award.

Despite the lateral driver displacement, off-axis traces are fine in the horizontal plane, and good vertically too provided one stays within the fairly generous 'window' of the treble beam, which extends right to the edge of the 93cm ribbon.

SOUND QUALITY

Very clean, highly transparent and unusually detailed: "like Waterford Crystal", the *CS* was certainly the favourite in a hard day's comparative listening on absolute sound quality grounds, if not on practicality. Amidst a succession of monopoles and a hybrid, its lack of any boxy qualities was immediately apparent and very satisfying to all, contributing to the fine detail and dynamic range resolution.

Stereo images are created with the sort of depth layering and precision that only panel speakers seem able to achieve, though subsequent comparison with the laterally symmetric Quad confirmed the slightly over-wide nature of the *CS* images. However, the price of this enticing insight into the microstructure of recordings is a certain lack of substance, caused, I suspect, by the way the image moves in response to head movement, and the way the balance shifts too if one moves around the room.

Whilst appreciating these notable virtues,

at least two panelists (self included) had reservations about a certain 'softness' and lack of drama and 'wallop': "Like a giant pair of headphones", to quote the other. The immense detail was not quite matched by the precision of timing information that has much to do with musical performance.

This tended to be reinforced by a lack of sufficient amplifier power to get these Apogees really working: the Krell *KSA-80* I'd borrowed for the task didn't have enough welly, so something like a *KSA-200* (or two, at five and half grand each) would not be inappropriate.

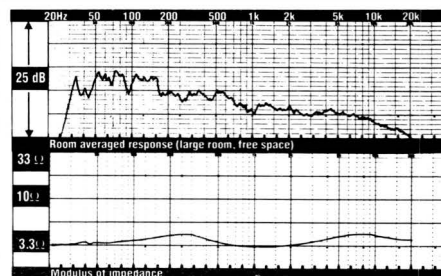
I say 'or two' because although my own *NAP250s* lack either the voltage or the current to get decent levels from *Calipers*, I did find a big improvement when using two *250s* to bi-amp drive. Focus and speed were both significantly improved, to the point where even I was starting to be won over, though the inability to generate any real level or sub-sonic bass extension – or satisfactorily accommodate my own personal idiosyncrasies in height and habit – would keep pushing me towards the *Divas*, were I able to afford them.

CONCLUSIONS

I think all the panelists would have hastily converted their hatchbacks and made off with the *Calipers* had they been given the opportunity, simply because the things they do do well, they do so very, very well. Such praise alone makes Recommendation mandatory, though it's not a speaker for the more casual listener, and will not suit all tastes gaining on the transparency roundabouts what it loses on the dynamic swings. The actual purchaser of the review pair is using four Magnum *A100* monoblok power amplifiers, costing roughly £4,000, which seems to be about the most cost-effective – if not the sensible minimum – solution to amplification. This takes the *CS* into a quite different cost league from the other large loudspeakers being assessed – just like its sonic performance.

TEST RESULTS

Size (height x width x depth)	122 x (59-70) x (65-28)cm
Weight	42kgs
Recommended amplifier power	150-400watts
Recommended placement	1m+ from wall, experiment
In room averaged response limits 50Hz-10kHz	± 4dB
Large room/space LF roll-off (-6dB ref midband)	30Hz
Large room output at 20Hz (ref midband)	-20 + dB
Estimated midrange sensitivity (ref 2.83V, 1m)	81dB
Impedance characteristic (ease of drive)	needs massive current capability
Forward response uniformity	very good
Typical retail price inc VAT	from £3,150



B&W 801 MATRIX SERIES 2

B&W LOUDSPEAKERS LTD., MARLBOROUGH RD., CHURCHILL IND. EST., LANCING, W. SUSSEX. TEL: (0903) 750750.

With prices starting from £2,500, depending on finish and extras, it's no surprise to find that the *801 Matrix Series 2* is the flagship in B&W's range, at least as far as the hi-fi marketplace is concerned. (There is a much larger *808*, but that's intended for high level studio pop monitoring.)

The *801* series has been probably the most successful domestic/professional crossover loudspeaker in recent years, and is regularly found in recording studios, especially for classical monitoring work. Indeed, the demonstrators which arrived for review were coincidentally the same as those I'd heard in Oxford Street's Air Studios a month or so earlier, when Dolby Labs presented its new type S noise reduction system.

Matrix and *Series 2* are the latest refinements of a design concept that first appeared about ten years ago, when both B&W and arch-rivals KEF introduced similar 'commode-and-head' configurations to take account of an acoustic principle which is no less valid today – or tomorrow, for that matter. Each has since steadily refined and developed the concept in its own particular way.

In B&W's case this has involved applying its proprietary 'matrix' cabinet engineering to the bass enclosure, so that the large area panels are extensively stiffened along both major axes by internal partitioning. The *Series 2* mods are pretty extensive too, using CAD (computer aided design) techniques to extend the bass and improve its sensitivity, with the help of a massive magnet and lumped parameter modelling. The midrange has been left much as before, but the treble is now handled by a new metal dome tweeter.

Yes, the *801* is basically a traditional three-way design, with separate drivers handling bass, midrange and treble duties. But instead of lumping them all in one box, each has its own dedicated enclosure. Ever since hearing about Goldilocks' close encounter with three bears, the idea of using a big driver for the bass, a middle sized driver for the midrange and a tiny driver for the tweeter has seemed intuitively logical, but the reason for making the cabinets different sizes is less easy to grasp. In fact it's all to do with maintaining an even distribution of sound on and off axis.

One of the major sources of coloration in loudspeakers arises from the relationship between the size of the source and the frequencies (or more precisely the wavelength which corresponds to the frequencies) it is required to reproduce. As long as the wavelength is longer than the width of the driver or baffle, the sound will radiate pretty evenly in all directions, wrapping around the edges of the baffle. But as the frequency/wavelength starts to get close to the baffle width the sound starts to focus forwards, so the edge of the cabinet creates an acoustic discontinuity.

By arranging for each driver to have its own baffle, *801* ensures that the 'focusing' effect is not concentrated on a single frequency. Each driver has the optimum



acoustic environment to ensure wide distribution to as high a frequency as possible, so providing similar radiation patterns for each over its respective working range.

That's not all. Look closely at the design and you notice how much painstaking care has gone into generously chamfering and shaping any edges, again to improve distribution – in fact the device has been artfully used to stamp a genuine individuality and identity on the appearance. I'm not sure I'd exactly call the *801* a pretty loudspeaker – purposeful and assertive, maybe – but I must acknowledge that it has been beautifully

detailed to create an attractive overall coherence, despite the rather odd basic shape(s).

The commode/head approach has additional flexibilities over the single baffle, allowing both the designer and the user to adjust the positions of the drivers relative to one another. The midrange is therefore set back from the bass driver and the tweeter from the midrange, the built in settings allowing the designer extra scope in controlling driver integration in the vertical plane through the crossover points.

The 'user adjustment' is that the whole head may be rotated on a small cylinder

about its single vertical fixing screw, allowing the horizontal axes to be adjusted to suit site or listening position without re-orienting the whole cabinet. Electrical signal connection is carried through to the main enclosure via a Canon plug/socket concealed within the cylinder. However advantageous this whole arrangement may be acoustically, in this age of spike-coupling it does perhaps involve a measure of mechanical compromise.

I have similar reservations over the fixing of the drivers, though it's only fair to point out that this is a debatable issue. Certainly neither the bass nor midrange driver mounting screws were tight, but I suspect this is because the drivers are deliberately decoupled in a controlled way, to avoid transmitting energy from the driver and hence exciting the cabinetwork. The corollary of course is that the driver frames are not mass- and stiffness-loaded by the cabinet and support.

Given the controlled driver decoupling, I was unwilling to risk putting the system out of adjustment by removing drivers for internal inspection. Cutaway photos in the colour brochure suggest that the matrix stiffening of the bass chamber here consists of three interlinked vertical braces, two across the sides and one fore and aft. This is rather less elaborate than some matrix boxes, but the tuned port enclosure system needs to allow free air movement.

Although it appears to be merely a big bass 'bin' with edges shaved off, the 801 has other secrets. As delivered, with castors fitted, it sits snugly just above the floor, but in fact there's a false bottom and a cavity a couple of inches high, within which is mounted one of the most elaborate crossover networks I have ever seen. Some of this is the APOC protection circuitry; some is the normal crossover network; and some is the fourth-order low frequency alignment.

The back carries gold-plated Michell socket/binders for bi- but not tri-wiring/amping, combining mid and treble whatever. A pity therefore that the tiny black-on-black embossed labelling isn't easier to read: I managed to connect them out of phase on one vital occasion (no, not the listening tests!). The moulded, shaped front port is a generous sized, well shaped tube, the faceplate incorporating an LED which illuminates if bigger amplifiers than mine should manage to trip the protection. The specification power handling of 600W suggests this won't happen too often.

The bass driver itself has a very large 25cm plastic cone, with a wide lossy surround, while the midrange uses B&W's proprietary Kevlar-based material in a 9.5cm cone. The tweeter is a 26mm metal dome, with an elaborate ventilated annulus phase compensator. Each driver has its own well designed grille for protection and aesthetics, and certainly looks better with these in place, while the top surface of the bass enclosure consists of a shaped wire frame grille with absorbent foam underneath, to minimise reflections from the head unit.

Whereas the bass enclosure does give some response to the knuckle test – if surprisingly little for a cabinet of its size and shape – rapping on the head assembly will

merely lead to bruising. This small but very heavy structure looks sensibly deep, and is apparently made from a laminate of structural foam and fibrecrete. Don't drop it on your foot during assembly. The tweeter sits in its own little 'carbuncle' on the top, and seems securely enough fixed, though I'm not sure quite how.

There are a couple of optional extras too, for £150 each. The first is a little mains powered bass equaliser with two pairs of phono sockets. When inserted between pre- and power amplifiers (or in a tape loop) this changes the LF characteristic to a sixth-order Butterworth, providing specification (anechoic) extension down to 19Hz (–3dB), with more rapid subsonic roll-off.

There's also a stand, which can be used to lift the speaker about eight inches off the deck. This may be helpful if the bass is too strong, but in fact it lifts the mid/tweeter axis a little too high off the ground for normal domestic seating, and is really intended to raise the units high enough to clear control desks in recording studios. Long and substantial spikes provide the sensible alternative to the temptingly convenient castors.

TEST REPORT

Given the highly impressive credentials and pedigree, I wasn't too surprised to find a near-exemplary measured performance. The frequency balance stays within pretty close overall limits across the band, given the inevitable room modes at the low frequency end. Indeed, very low frequencies are unusually tidy by any standards, the mid bass less so, while the mid and treble is impressively smooth for such a large loudspeaker. It's just about possible to detect the individual contributions of the three drivers, but no more.

The bass equaliser adds approximately 5dB in-room in the region 20-45Hz, and on the basis of these measurements I'd suggest its purchase and use is optional. Extension is certainly fine in my room without it, though another, perhaps larger room, with boundaries further away from the cabinets might find the extra boost helpful.

B&W claims 87dB/W sensitivity, though I would have plumped for 86dB/W under different conditions. Either way it's a shade below average, but the load looks easy enough to drive and power handling is of course no problem. As might have been expected, on- and off-axis correspondence was very good indeed.

SOUND QUALITY

Impressively neutral and free of most 'boxy' effects, the 801 delivers a very civilised if rather 'warm' and 'softened' sound. Treble excesses are kept sternly under control, minimising fatigue, which one appropriately experienced panelist pointed out would make them a very good choice for day-in-and-out monitoring. Another described it as: "not a hi-fi freak's speaker, but simply fit and forget for enjoying music in the home".

As a bit of a closet hi-fi freak myself, after a couple of weeks of day-in-and-out I am forced to agree with them. The 801 does offer an easy-listening sound that is often intriguingly revealing of the source material –

especially in such matters as microphone placement and types. I particularly enjoyed some of the better examples of NICAM stereo TV drama and films, while CD and radio broadcasts were also pretty acceptable. But my favourite vinyl was a much less satisfying experience, the dynamics seemed muted and timing somehow 'off'.

There's an impressive seamlessness in the way the drivers integrate acoustically. Stereo images have good lateral positioning with fair focusing and depth, but the soundstage lacks true transparency and sparkle, while 'woolly' LF definition compromises solidity. Spikes are better than castors, though the difference was less than expected, while bi-amping too made a disappointingly slight improvement in focus. The inclusion of the LF equaliser seemed pretty subtle.

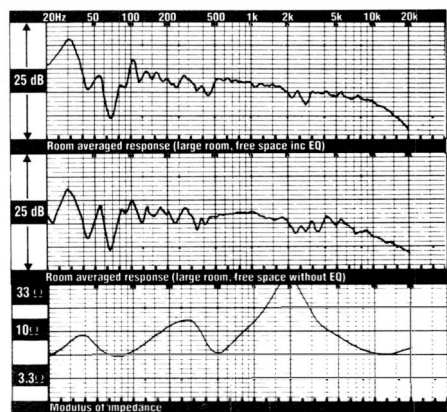
CONCLUSIONS

The *Matrix 801* is impressive in a number of ways, though I can't help feeling that its aesthetics and characteristics are rather better suited to the large recording studio, directing its formidable acoustic capabilities to the subtlety of microphone placement, since it looks a bit of an awkward beast in the (normally) smaller domestic lounge.

There's no gainsaying that the measured frequency balance is impressively accurate, as is the acoustic 'seamlessness' through the vital midband. Those who prize natural tone colours and a freedom from acoustic nasties will be well pleased to find these qualities alongside fine bass extension, generous loudness capabilities and a full-bodied sound. Invariably pleasant, and in some respects impressively accurate, the *Matrix 801* clearly deserves Recommendation, though I can't help feeling that many enthusiasts will find it lacking in less tangible qualities such as transparency, speed and excitement.

TEST RESULTS

Size (height x width x depth)	77/99 x 56 x 43cm
Weight	44kgs
Recommended amplifier power	50-600watts
Recommended placement	away from walls, stands optional
In room averaged response limits 50Hz-10kHz	±5dB
Large room/space LF rolloff (–6dB ref midband)	below 20Hz
Large room output at 20Hz (ref midband)	0/–5dB (with/without EQ)
Estimated midrange sensitivity (ref 2.83V, 1m)	86dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical retail price inc VAT	£2,500



MISSION 767

MISSION ELECTRONICS, STONEHILL, HUNTINGDON, CAMBS PE18 6ED. TEL: (0480) 52777.

£2,500 is a lot of money for a pair of loudspeakers, and only represents the 767's starting price. But the struggle to get these monsters into the house and unpacked – or more precisely partly unpacked, then manoeuvred into the house before final unpacking – left me deeply impressed by the sheer quantity of engineering involved. The bathroom scales confirm the quoted figure of 75kg per cabinet, which is arguably too much for even a two-man lift. My Black and Decker trolley barely survived, and that's just the loudspeaker.

The 767 system also comes complete with electronics, specifically a special *LFAU* (low frequency alignment unit) amplifier based on *Cyrus 2* for driving the bass end of the system. Mission describes the approach as 'part active' (though 'part passive' would be no less precise). As with any conventional passive loudspeaker, the source signal is taken from an existing amplifier's loudspeaker terminals, but instead of linking directly to the loudspeakers, the cables are fed to a set of terminals on the *LFAU*.

The *LFAU*'s rear horizontal connection ledge has three more sets of 4mm socket speaker terminals. Two of these sets are busbar linked to the input and merely serve to carry the original full bandwidth power signal in bi-wire mode on to the mid and treble terminals of the cabinets. The third set of output terminals represents the output of the *LFAU* and is the 'active' part of the operation. It takes the power signal as an input and then delivers carefully pre-equalised low frequency power to the bass driver terminals on the speakers.

This is an elegant and cost-effective approach to providing at least some of the benefits of active operation. Separating out low frequency drive in this way means the *LFAU* takes over the burden of driving power-hungry bass drivers, leaving the existing system amplifier to drive a loudspeaker no more complex than a *Cyrus 782*.

Furthermore, the ability to adjust the bass level independently of the mid and treble avoids the need to compromise system sensitivity in the search for bass extension, while subtle LF equalisation tailoring allows the balance to be optimised to match room, system and placement considerations. There may also be some advantage in directly coupling the amplifier and bass drivers in this way, though there is clearly some disadvantage in that the bass signal has passed through two separate power amplifiers in series.

The basic £2,500 package may consist of the pair of loudspeakers and an *LFAU*, though the package that was brought down for my delectation was well above the base model. Its stunning black piano lacquer finish currently carries a £500 price premium, though there was talk that this



may have to increase significantly soon. Another optional and supplied extra was a (£230) *PSX* power supply unit, to give the *LFAU* a helping hand.

In fact Mission brought down a complete *Cyrus* driving system, with CD player and *Cyrus 2/PSX* amplification, not to mention a drum of *Cyrus* solid-core cabling, so most of the auditioning was carried out in context of

a one-make system, the top of the Mission line-up. In this context, we're talking something over £2,000 for the loudspeakers, driven from source and amplification components that total much less – a balance of expenditure at odds with the current UK fashion. Nowadays this tends to favour concentrating expenditure on the front end components at the expense of smaller and

less costly loudspeakers.

The loudspeakers themselves are unusually large, and distinctly assertive with it, especially used as supplied (and probably intended) without any form of grille. According to the manual, grilles are normally included, for those who prefer to keep both drivers and an abundance of company logos hidden from view. Tallness may be the dominant gene, but these monoliths are also fairly deep, which will keep the baffle well clear of reflection even if the speaker is wall mounted (which is entirely feasible, due to the adjustable bass).

The imposing physical presence is sensibly moderated by a fairly narrow width and attractive post-formed edging, features which should also help promote good stereo imaging. A most elegant little plinth provides the finishing touch, and proper cone/spikes are supplied for rigid floor coupling.

The shape and weight distribution are not ideal for stability (in a mechanical sense; there's absolutely no chance of accidentally knocking one over), and a good strong floor is probably a prerequisite. The plinth helps increase the footprint, and the decent front-to-back depth ensures that any residual rocking occurs in the plane of the baffle, and is therefore innocuous.

A glossy and smart exterior is only part of the story, and Mission's in-house cabinet-works has gone to great lengths to ensure that the engineering integrity extends well beneath the skin. The whole thing is fabricated from massively strong 25mm MDF panels, each individually damped with bitumen pads. The midrange and treble drivers have their own 'cabinet within the cabinet' – an enclosure dimensionally not dissimilar to the *Cyrus 782*, which the driver array also resembles. This automatically provides considerable bracing for the main carcass sides.

Unlike the much less costly *Cyrus* and *Mission* models, the *767* is a fully sealed box – or, more precisely, two sealed boxes, one within the other. Each uses twin top quality, plastic cone drivers operating in parallel into each fibre-filled enclosure, the top and bottom bass chambers being joined behind the inner enclosure. The bass drivers have 170mm cones and narrow surrounds, the bass/mid is a 120mm unit with heavier termination. The tweeter looks similar to that used in other *Mission* models – a 25mm soft-dome with short horn flare.

All drivers have cast chassis, and were really tightly screwed home into T-nuts, providing further evidence of the engineering integrity. Given *Mission's* enthusiasm for solid-core cables (about which I am yet to be persuaded), I was mildly amused to find heavy multi-strand used internally, hard-wired on to the driver terminals. For fear of damaging the glorious finish, I didn't attempt too much dismantling, and didn't come across the crossover network in my limited exploration. On the evidence elsewhere, I wouldn't be surprised if it didn't match the massiveness of the impressive gold-plated

tri-wire/amp terminals, neatly mounted in a recessed block.

In the interests of good stereo imaging, the driving array is symmetrical in both horizontal and vertical planes. The paired bass and mid drivers go some way towards simulating a point source centred on the tweeter, whilst at the same time adding an element of 'line source' behaviour. The substantial overall height, the driver placement, plus the narrow baffle and post-formed edging should all help create good consistency over a wide listening area.

TEST REPORT

The most striking aspect of the *767's* measured performance is its very impressive bass extension, achieving a 'flat' output right down to 20Hz in-room – a feat very rarely achieved, but probably important in creating a 'full size' sense of scale. The peaks at 30Hz and 55Hz are largely room anomalies, while the 100-150Hz suckout is probably phase cancellation between the bass and the bass/mid drivers, and is probably not too serious subjectively.

From 180Hz and on up the balance is near exemplary, with a slight step down at 700Hz and a slight 5-7kHz 'corner' the only mild aberrations. Consistency is highly impressive. So too is a sensitivity rating of 91dB/W, entirely uncompromised by a very straightforward impedance characteristic, enabling intimidating loudness levels to be achieved with a powerful amplifier, provided you limit the *LFAU's* gain and extension.

The *LFAU* level control covers about 5dB range at 20Hz, reducing to about 2dB at 100Hz; the action of the contour control is very subtle indeed. Off-axis traces confirm the fine acoustic integration of the loudspeaker, especially laterally, some phase lobing being measured along the vertical axis.

SOUND QUALITY

On the panel test day, the *767* received a mixed welcome, for reasons which became apparent later. The generous bass scale, weight and 'wallop' was well appreciated, but a general lack of subtlety and refinement was criticised, especially regarding the rather over-obvious quality of the tweeter.

Subsequent experimentation indicated that much of this was due to the electronics. Some weeks of listening to the supplied system made it clear that a single *Cyrus 2/PSX* driving amplifier is not really enough. The *767* may be a bit of a bruiser, but it is also fundamentally quite neutral, very transparent and most sensitive to the quality of the driving source, which is of course one of the hallmarks of a fine loudspeaker.

Passive Naim and Krell drive had already brought big improvements when *Mission* returned with an extra *Cyrus 2/PSX* to bi-amp the beasts. The improvement over the single *Cyrus 2/PSX* was dramatic, turning the *767*-based system from 'impressive but I couldn't live with it' into 'this is mildly awesome', by removing much of the brashness

and substantially enhancing the solidity and precision of the stereo soundstage. Time ran out before Naim bi-amping could be attempted, which in hindsight was probably a pity, but many of my earlier reservations had already been dispelled, so no matter.

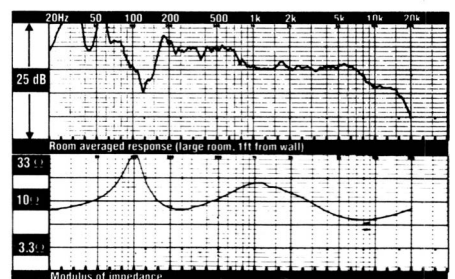
The *767* is easy to drive and goes impressively loud, to the point where the *LFAU* starts to clip, by which time those in adjacent buildings will be banging on the walls. The package is perhaps better suited to CD and broadcast sources than 'high end' vinyl disc, and ultimately the attainable standards will be limited by the 'fixed' combination of *LFAU* electronics and LF enclosure, which is very good but falls a little short of the best in poise and timing.

CONCLUSIONS

The *767* is a very impressive package in very many ways, and certainly offers sufficient engineering content to justify Recommendation at its £2,500 price tag (assuming you can resist the fabulous piano finish), for those with a big enough room to accommodate the imposing enclosures. It succeeds admirably in the difficult task of combining subtle acoustic performance with wham bang bass extension, and low coloration with very satisfying dynamics and headroom. Ultimately limited by the *LFAU*, optimising the drive system is a bit tricky, but CD fans should be well satisfied with *LFAU/PSX* + 2 x *Cyrus 2/PSX*; however, I can't help wondering whether *767* might be a harbinger of *Cyrus 3* to come...

TEST RESULTS

Size (height x width x depth)	138 x 29 x 43cm
Weight	75kgs
Recommended amplifier power	15-150watts
Recommended placement	flexible
In room averaged response limits 50Hz-10kHz	±7dB
Large room/space LF rolloff (–6dB ref midband)	below 20Hz
Large room/wall LF rolloff (–6dB ref midband)	below 20Hz
Large room output at 20Hz (ref midband)	–2dB
Estimated midrange sensitivity (ref 2.83V, 1m)	91dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical retail price inc VAT	from £2,500



MONITOR AUDIO REFERENCE 1800/GOLD

MONITOR AUDIO LTD., 34 CLIFTON ROAD, CAMBRIDGE CB1 4ZW. TEL: (0223) 242898.

Monitor Audio is a long established manufacturer that has become something of a middle-of-the-market specialist. It has also gained a particularly good reputation for the high quality of its in-house cabinetwork, and has been one of the leading proponents in the move towards metal domes for treble unit diaphragms.

Monitor's earliest days saw giants like the MA1 and MA3 models, but for the past decade the company has followed the trend in public taste towards smaller designs, with a succession of successful stand-mount models. Now the MA 1800/GOLD reviewed here (along with the 1200 covered in March '89) represents a return to a floorstanding configuration – another trend which several manufacturers have recently adopted – but with an enclosure which is much slimmer and more elegant than its ancestors.

Although it does represent a new flagship model, the 1800 doesn't quite fit in with the context of this test group. £1,299 is a hefty enough price for a pair of loudspeakers, but it's only two-thirds that of the next model up, and less than half the group average. Weight for weight, its 17kg/£1,000 stacks up pretty well against all but the Mission, but the technological brownie point count comes out firmly at the bottom of the list. Despite the protestations of MA's persuasive propaganda, the 1800 is penultimately a prosaic, if ultimately a very pretty loudspeaker.

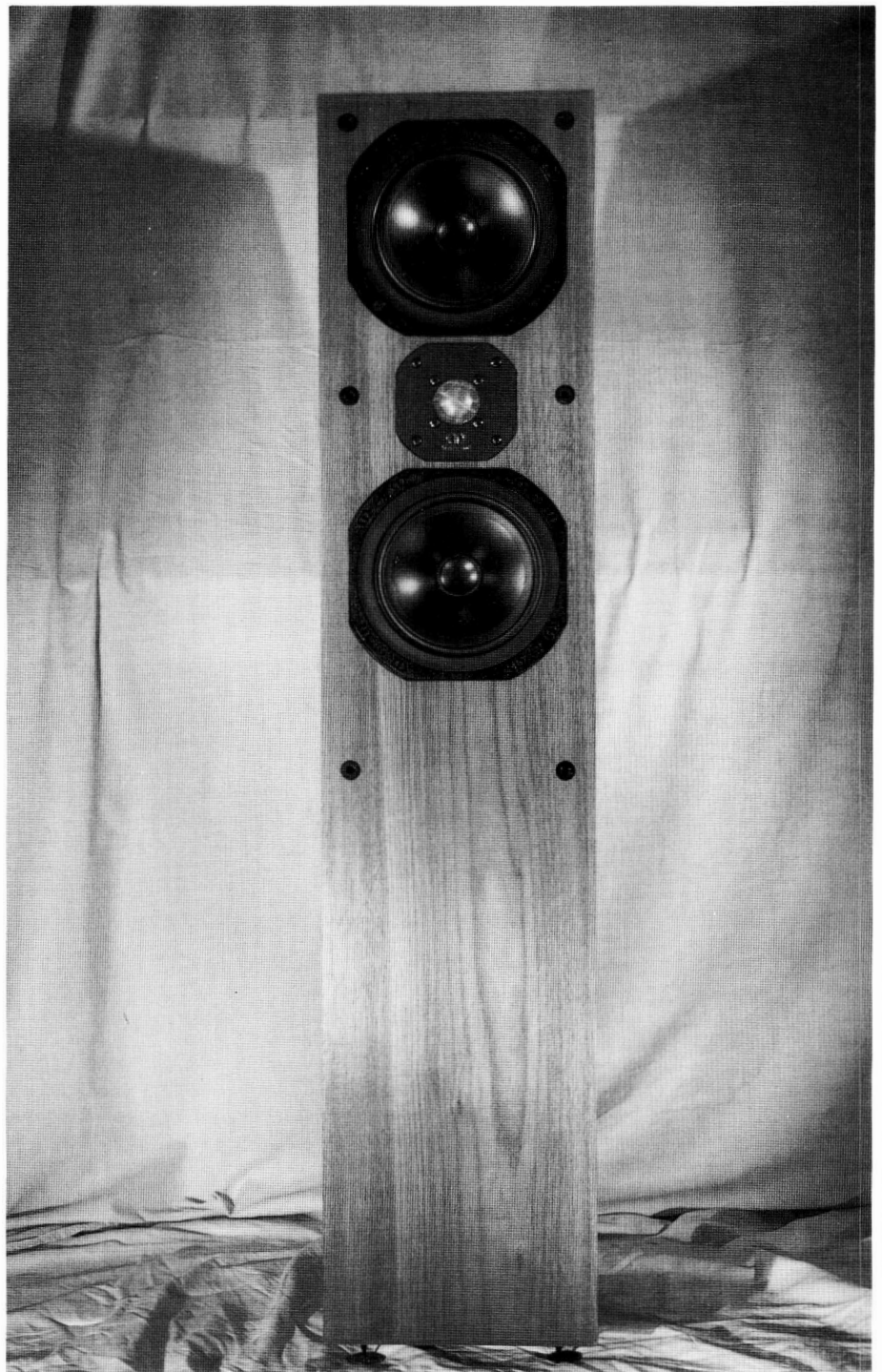
The beauty is a little more than skin deep, since the cabinetwork is constructed in 19mm MDF, which is pretty tough stuff, though the veneer work and the personalised (cast) driver baskets and faceplates show how much effort has gone into the aesthetics.

Still I do feel it is a pity that the back panel has not been given the same pretty real wood veneer as the baffle and sides. It's fairly clear that the 1800 is designed to be kept away from the room walls, so there's a fair chance the back will be on view, depending on the room layout, angling of baffles etc, and the black textured vinyl is a bit of a let down at this price.

Certainly the driver technology is bang up to date, if rather less 'uniquely Advanced' than the propaganda asserts. There's nothing particularly new or radical in vented foil/Nomex voice-coil formers, though the stiffening concave dust cap is a relatively new development (along with even stranger looking phase-plugs), though one which is already quite widely used.

The smallish but beautifully formed main drivers use 120mm polymer cones with a quite strongly flared profile, and a generous surround. 16ohm voice coils are used so that the two connected in parallel still leave a 'kind' 8ohm amplifier load. The tweeter is a fine quality 26mm aluminium dome, with 'gold' anodising to increase stiffness and raise the diaphragm resonance well above audibility (26kHz).

A mesh grille protects the delicate



diaphragm against probing fingers, which is a sensible precaution whether or not the good quality but distinctly anonymous-looking half-grille is used. (It quite spoils the appearance and the retaining studs left visible if it's not used could be prettier too.)

The cabinet is ported at the rear with twin 11 x 7cm tubes, nicely chamfered into the rear panel. Cabinetwork is to the expectedly high standard, inside and out, though given the size of the panels, I was surprised not to

find some form of bracing or stiffening apart from a false bottom 25cm from the actual cabinet base. However, the sides do have bituminous damping pads, and the enclosure is lined in good quality acoustic foam.

The false bottom actually reduces the effective cabinet volume slightly, but permits the enthusiastic to add a little mass damping via an inspection chamber in the base. This business about adding lead shot or sand to the bases of floorstanding speakers (or to

column stands) seems to be spreading. I can understand the manufacturer, be it MA or Tannoy, being unwilling to take on both the shipping costs and the handling difficulties of adding such material at source, so maybe it comes down to the dealer to undertake the task, as part of the normal installation, though quite who should bear the cost remains debatable. Currently the punter is left to make the effort to find the materials, funnel and what-have-you, when all he really wants to do is get connected up and make music, and consequently probably doesn't bother. Until the situation is formalised within the trade, this unsatisfactory state of affairs is likely to continue.

Apart from having still failed to get around to visiting an angling or gun shop as deadlines loom menacingly close, my only gripe over the 1800 was the perversity of a spike-fixing arrangement that seems prone to jam, rendering one or more spikes unadjustable and irremovable, which is a distinct inconvenience (or will be when I try to put them back in their cartons for shipping).

On the plus side it's nice to find the drivers properly screwed home, and with T-nut fixing to boot. Internal wiring uses really heavy gauge cable to and from the ultra-simple two-element crossover network, which is mounted on the back of the bi-wire/amp terminal block.

The configuration of two parallel bass/mid drivers mounted above and below the single gold-anodised metal dome tweeter on the slim baffle should ensure inherently good acoustic performance and driver integration. Bracketing the tweeter in this way, it may be argued that the effective source of the bass/mid drivers becomes coaxial (colinear but not necessarily coincident), which has got to be a good starting point when trying to integrate the acoustic output of the drivers. However, unlike the genuine coaxial driver, at and around the crossover point the three actual sources will tend to behave as a line – rather than point-source, a situation which has its own radiation implications.

In fact, the 1800 will behave as a point source at low and high frequencies, but take on some of the characteristics of a ribbon through the midband, tending to focus and better project into the far field the output in the vertical plane. This is an observation rather than a criticism, since it need do no harm, but it does add a measure of unpredictability in room matching. One might expect some extra forwardness and brightness when listening from a fair distance in a room with reflective side walls, for example.

TEST REPORT

Sensitivity is a comfortable enough 88dB/W or thereabouts, and this is creditably achieved with the mildest of 8ohm loudspeaker loads. Bass is pretty well extended down to around 40Hz, rolling off quite steeply below this, though the upper bass does look

rather prominent and a little inconsistent too. Comparison of wall-mount and free-space traces show the latter gives by far the most even – though still somewhat uneven – balance through the bass region, despite the odd glitch introduced at 1.1kHz, which I'm at a loss to explain.

Despite the simplicity of the crossover and the lack of any electrical equalisation, the 1800 succeeds in delivering an unusually even mid and treble room response and an almost seamless crossover region. There's some unevenness to be sure, but the overall balance is very smooth for a large enclosure.

Nearfield measurements confirm excellent horizontal and good vertical off-axis uniformity, the latter showing some phase cancellation lobes through the broad driver overlap region that comes with the simple crossover. Although the port's main contribution occurs between 40Hz and 100Hz, its output at 200Hz is perhaps a little too strong. Best left off, the grille nevertheless causes only marginal impairment.

SOUND QUALITY

Hopes that the 1800 might do a giant-killing act and put its much larger and more expensive rivals in their place remained unfulfilled. This Monitor Audio makes a pleasant enough sound overall, but in a bland and inoffensive rather than informative or pulse-quickening way, while sloppiness and emphasis in the upper bass was noted and criticised by all.

I should have liked to have checked out the effect of mass loading the bottom cavity, and would have done so had not an incipiently slipping disc put any lifting off limits for the last fortnight before copy dates. On the assumption that it's unlikely to make matters any worse, I would regard this modification as well worth trying. But however successful it is in helping to hold the bass together, there's no avoiding the fact that it's covering up for the flawed basic performance of the standard enclosure, whether due to the porting, the long unbraced verticals, or even the column of air inside.

After listening to other significantly larger models, going down in scale to the 1800 was in some ways a pleasant experience, bringing a degree of intimacy that grander models are less able to achieve. And at lowish listening levels the grumble-along-bass was subtle enough to be perceived more as a mild 'loudness' contour that undoubtedly made them easy on the ears.

Aside from the bass, the good basic balance and well behaved responses ensure that a decent stereo soundstage is created, with fair depth, though genuine transparency is not achieved. Coloration is pretty well controlled too, though some cuppy nasality is added to vocals.

Rather surprisingly, bi-amping did not bring any worthwhile improvement, as expected; in fact, if anything the sound

seemed preferable and better integrated when a single amplifier was used.

CONCLUSIONS

A model like the 1800 should have wide appeal, combining decent box volume with the sort of attractive presentation that will be much more widely accepted domestically than the other more expensive models in this test group. But confronted by the question of whether it does a better job than similar size but significantly cheaper models like the recently reviewed Tannoy DC3000 and KEF C95, the answer has to be no. In this instance beauty does turn out to be largely skin deep. Although the 1800 measures well enough and is both pleasant and easy on the ears, neither subjective performance nor material content can be said to justify the £1,300 pricetag.

POSTSCRIPT

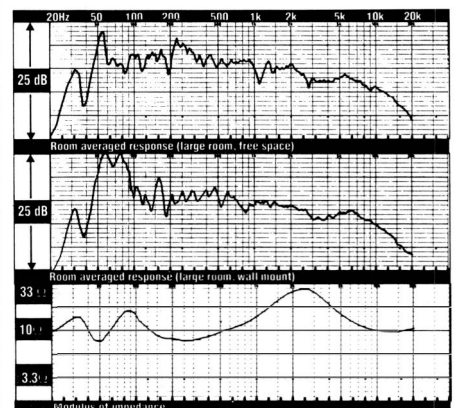
With a return to partial fitness, I finally tackled the lead-shot-and-sand tweak, adding some 14kg of ballast to each 22kg enclosure, which took up about a third of the available space in the lower sub-enclosure.

The much lower centre of gravity certainly aids overall mechanical stability. Although the measured frequency balance remained unchanged, and the slightly rich, mid-bass prominent character is much as before, much of the vagueness and imprecision was banished.

I wouldn't go so far as to describe the ballast-modified bass as particularly authoritative, but it is no longer the obvious source of weakness found in the ex-factory condition. Those attracted by the 1800 should ensure the dealer helps carry out this important modification.

TEST RESULTS

Size (height x width x depth)	106 x 22 x 32cm
Weight	22kgs
Recommended amplifier power	20-150watts
Recommended placement	on floor in free space
In room averaged response limits 50Hz-10kHz	±7dB
Large room/space LF rolloff (-6dB ref midband)	30Hz
Large room output at 20Hz (ref midband)	-20dB
Estimated midrange sensitivity (ref 2.83V, 1m)	88dB
Impedance characteristic (ease of drive)	very good
Forward response uniformity	very good
Typical retail price inc VAT	£1,299



SD ACOUSTICS RIBBON

SD ACOUSTICS, UNIT F, 179-183 RIVERSIDE BUSINESS CENTRE, BENDON VALLEY, WANDSWORTH, LONDON SW18 4LZ. TEL: (01) 874 7764.

SD Acoustics is a small West London company that has built a steady following and an impressive roster of specialist dealers, for what is now a five-strong range that includes some unusual and interesting design features. I developed rather a soft spot for the mid-priced *OBS* when reviewing it recently, but have yet to sample the others in the range.

The £2,000 *Ribbon* is a brand new 'flagship' model, first introduced in Autumn 1989, with no prizes for guessing its USP (unique selling point). It shares some of the characteristics of the original *SDI*, both being tall and both using ribbon-type transducers to cover the treble range. The *Ribbon's* £800 price premium is due to the fact that the ribbon unit here is much larger, is designed and manufactured by SD, and covers the whole mid and treble two-thirds of the spectrum.

However, the bass uses conventional moving-coil drivers (two of them) in a conventional enough reflex enclosure, so the *Ribbon* is actually what's known as a hybrid, combining two different types of transducers. The optimistic view is that hybrids provide the best of both worlds, which to some extent is true. Less charitably hybrids may be accused of being neither one thing nor the other, which again has validity. Certainly hybrids do have difficulties which are not easily overcome, while at the same time possessing real practical advantages too.

Before discussing the compromises, a ribbon is a sufficiently unusual transducer to merit a few words of introduction. The ribbon principle is very well established in the history of sound reproduction, though it was always more common amongst microphones than loudspeakers (a microphone being a loudspeaker working the other way round).

Indeed, placing a strip of aluminium foil between the poles of a horseshoe magnet and noting the deflection when a current is passed is the standard secondary school physics demonstration of the Fleming relationship between mechanical force, electricity and magnetism. If you were to replace the lead acid battery source with a power amplifier, you could make the strip of foil play music instead of merely moving.

In a sense it's a bit like taking an ordinary moving coil driver, throwing away the cone and retaining just the voice coil and magnet. Both are unwound and the coil flattened and the magnet split, and you have what amounts to a ribbon driver.

Using just the voice coil has an attractive purist simplicity, but if you happen to have an old and unwanted drive unit hanging around, try cutting the cone off and you'll appreciate the downside too. It doesn't go very loud, nor does it work very effectively down into the bass. Which is why ribbons are most often found as tweeters, and why they tend to need a lot of magnet and are consequently expensive. (They're also difficult to mass produce.)

Back to the *Ribbon* in question, the mid/treble unit here is a sub-assembly 75cms high



and 18cms wide, built up on a substantial perforated metal backplate. Several thin permanent bar magnets run vertically between the backplate and the ribbon itself, which is divided into nine strips – three 5mm wide, and six 15mm wide. This gives a total radiating area of 80 or so centimetres squared, which should be more than sufficient for midrange and treble duties.

One of the nice points that ribbons share with other planar or 'area drive' driver systems like electrostatics is that the diaphragm surface is very light indeed, so its motion is to some extent controlled by the air

itself, while the lack of inherent mechanical stiffness makes normal enclosure working inappropriate – as far as possible, it's better to have equal forces operating on the front and back.

The normal approach, adopted here, is to use the panel as a dipole, a device which radiates (more or less) equally from both faces, but out of phase. The result is phase cancellation in the plane of the panel, and maximum radiation at right angles – in other words a figure-8 pattern. However, this only works for frequencies above that whose wavelength corresponds to the width of the

source: longer wavelengths (lower frequencies) cancel unless the panel or baffle is very large. Obviously, using such a driver for mid and high frequencies allows the dipole to be kept as narrow as any conventional loudspeaker: full range ribbons and panels are a very different proposition (see Apogee review).

It is also more or less essential to site a dipole driver well away from reflective surfaces, especially a rear wall. And it may be helpful to introduce some anti-reflective measures, such as curtains or wall hangings.

Acoustically the *SD* is very much the opposite of, say, the B&W *Matrix 801*. Where the *801*'s structure is expressly designed to minimise the 'focusing' effect by keeping the sources small in relation to the wavelengths they are radiating, the *Ribbon*'s ribbon operates largely under 'focusing' conditions, which has various implications.

Look closely and you note that the ribbon is not a completely flat surface: the middle three thinner strips are mounted a little in front of the rest. And the baffle board has a wrap-around shape too. Both these factors and the narrow overall width help ameliorate excessive focusing in the horizontal plane, but the vertical plane is another story. High frequencies are only audible directly on the driver axis, which means a band of airspace that starts at 76cms above the floor and finishes at 145cm, which is a bit of a mixed blessing.

In fact if you're over six feet tall, and also have a bad back and like lying on the floor like me, it's a pain in the neck. If you're happy doing your listening at the 'normal height' dictated by the Great British three-piece suite, no problem. But any temptation to get up in order to get on down, as it were, is akin to placing cotton wool in the ears, at any rate for those of normal height.

What this does mean is that floor and ceiling reflections are minimised, while within the vertical axis 'window' there is a certain amount of variation in HF balance, which again is something of a mixed blessing. It is a bit disconcerting to hear the change when you move your head vertically, but it's nice to have some opportunity to 'fine tune' speaker and listener positions for optimum balance.

The *Ribbon*'s basic configuration mounts the ribbon driver on a vertical MDF frame, 9mm 'tryptich' side members helping stiffen the cutaway 15mm baffle (to a point). This is mounted on top of a quite compact, conventional bass enclosure, with rear-facing port and twin 155mm cone drivers. The maximum height is in any case constrained by the need to keep the back of the ribbon unobstructed, but no attempt has been made to compensate in width (which would be a pity), or depth (which would matter less). The result is aesthetically rather pleasing, but must leave bass extension somewhat restricted against the £2,000 norm.

Although adequate adjustable spikes are fitted, the small footprint combined with great height is not mechanically ideal, despite help from a little 5cm rear ledge. A

very simple crossover is readily accessible behind the ribbon unit, consisting of a two-element low pass arm feeding the bass and a large cluster of lumped capacitors feeding the ribbon. The feeds are entirely separate, permitting bi-wiring/amping.

The presentation is pretty enough, wood veneer top and base nicely contrasting the long black grille cloth, though the small scale production techniques are a little obvious – in the grille frame, for example. The whole package is surprisingly light in weight considering its height, and our well-travelled demonstrator's glue joints were getting a bit the worse for wear.

TEST REPORT

Unevenness is too much of a *Ribbon* characteristic to fix the sensitivity precisely, but the plots suggest a high 91dB/W, which corresponds with subjective findings. However, about 5dB of this is a function of an appalling low impedance characteristic which spends much of the spectrum below 3ohms, especially through the presence region which tends to correspond to music programme peaks. A chosen amplifier needn't have a particularly high 8ohm power rating to achieve high levels, but very generous current capability is absolutely mandatory to avoid premature protection circuit operation.

Although the response does show distinct unevenness that will create significant 'character' and some coloration, the broad balance is not bad at all, and bass extension is surprisingly good, especially considering the modest volume of the bass enclosure. But the output at and around 100Hz is clearly too strong, perhaps partly because the port output peaks 70-150Hz. Ironically, the balance probably would be significantly enhanced by near wall siting – which is not an option in view of the dipole ribbon driver characteristics.

The wide variation in treble output with listening height is indicated in the room response trace. Closer examination shows the 7kHz peak is most prominent on axis with the middle third of the ribbon, and less so through the outer thirds; however, the variation between middle and edge axes of the ribbon remains a rather dramatic 10dB. In complete contrast, the lateral off-axis curves showed stunningly good correspondence, right round to 60 per cent or thereabouts. Furthermore, the grille – thick frame or not – had a negligible effect.

SOUND QUALITY

If our listening panel is anything like representative, the *Ribbon* is destined for controversy. It's clearly not a loudspeaker for those sensitive to the colorations caused by an uneven balance and other essentially cosmetic sonic flaws. But those that place rhythmic integrity, 'bounce' and timing near the top of their list of priorities could well be won over, and the highish sensitivity helps it to go usefully loud.

Certainly the colorations are real enough,

with some nasality, hardness and 'fizzy' effects, depending on one's precise relationship to the very directional ribbons. This does afford some opportunity to 'tune to taste' for the listener prepared to stay in one place, though it's just as likely to prove a source of irritation.

The lack of genuine bass weight combined with a 'plummy' and over-rich upper bass was the most consistent criticism, but although there isn't the transparency of a full range panel, some of the magical stereo qualities are retained, albeit with some depth curtailment.

After extended personal listening I was beginning to find the *Ribbon*'s flaws starting to weigh distinctly heavier in the balances than its undoubted, if occasionally elusive virtues. So I tried bi-amping, and was confronted by a much greater improvement than anticipated. Scale seemed altogether bigger and the sound was somehow easier and more relaxed, even at modest levels. The upper bass was now much better inclined to stay under control and deliver information, while midrange detail and focus became significantly tighter and sharper.

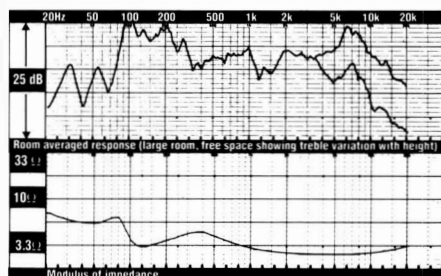
CONCLUSIONS

The *Ribbon* is too idiosyncratic for formal recommendation at a price which is high for the material content, but beneath the cosmetic flaws there are attractive qualities nonetheless. The measured impedance and subjective findings show that it is distinctly amplifier-sensitive, and experiment will be needed to obtain an optimum system match – a bi-amped valve set-up could well be a good place to start.

In a sensitively assembled system, the *Ribbon* should be capable of providing a fair share of ribbon transparency and magic alongside impressive speed and drive, for those prepared to put up with the 'hot seat' stereo discipline. Certainly it's flawed, but it's also fun.

TEST RESULTS

Size (height x width x depth)	152 x 30 x (15-30)cm
Weight	22kgs
Recommended amplifier power	15-150watts
Recommended placement	1m+ from rear wall
In room averaged response limits 50Hz-10kHz	±10dB
Large room/space LF rolloff (–6dB ref midband)	30Hz
Large room output at 20Hz (ref midband)	–13dB
Estimated midrange sensitivity (ref 2.83V, 1m)	91dB
Impedance characteristic (ease of drive)	needs substantial current delivery
Forward response uniformity	poor
Typical retail price inc VAT	£2,000



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
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
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
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
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
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
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LASER SOUND & VISION, 72 Terminus Road, Eastbourne, East Sussex BN21 3LX. (0323) 640911. Marantz, Cambridge, Kenwood, Denon, Rotel, Infinity, Tannoy, Michell, KEF, Heco etc. Dem room. Home trial. Free installation. Service dept. Visa, Access. 9am-6pm Mon-Sat.

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BOWERS AND WILKINS Ltd, 1 Becket Buildings, Littlehampton Rd, Worthing. (0903) 64141. B&W, Nakamichi, Castle, Denon, Dual, JVC, Mordaunt-Short, Philips, Quad, Sony, Technics. 3-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

RED RADIO SHOP AND HI-FI CENTRE, 11 Olive St, (Off Park Lane) Sunderland. (091 567) 2087. Castle, Denon, Bose, JVC, Kenwood, Mordaunt-Short, Michell, Teac, Tannoy, Shure. Demonstration room, large with comparator facility. Free installation. Service dept. Interest free credit and no deposit interest free credit. 9am-5.30pm daily.


WARWICKSHIRE

AUTHENTIC AUDIO, 25 Henley Street, Stratford-upon-Avon, Warwickshire CV37 6QW. (0789) 414533. Linn, Quad, M.F., Denon, NAD, etc. Dem room. Home trials. Part-ex. Service dept. Mon-Sat 9.30-5.30.


YORKSHIRE (NORTH)


ELITE HI-FI, 178 Kings Road, Harrogate HG1 5JG (0423) 521 831. Voyd, Valdi, Avalon, Systemdek, Helius, Audionote, Goldring, Audio Innovations, Sugden, Marantz. Mon-Sat 9-5.30. Free installation. Service dept.
RICHER SOUNDS, 66 Walmgate, York YO1 2TL. (0904) 645535. Probably the smallest hi-fi store in York; but stocks the A-Z of popular budget hi-fi at special discount prices. Facilities: expert advice; free monthly Newsletters; mail order; part exchange. Mon-Fri 10-6, Sat 9-5. Access, Visa, Richer ChargeCard and cheques up to £1,000 (subject to simple clearance).

SCARBOROUGH HI-FI CENTRE, 53 Dean Road, Scarborough YO12 7SN. (0723) 374547. A&R, Bose, QED, Denon, Nad (incl. Monitor series), Thorens, Onkyo, Tannoy, Marantz, Ruark Dem Room. Appts preferred. Home trial facilities. Mail order and part exchange. Visa, Access, Diners, Hi-Fi Markets Chargecard facilities. Open 10-6 Mon-Sat.

SOUND ORGANISATION YORK, 16 Gillygate, York YO3 7EQ. Tel: (0904) 627108. Linn, Naim, Rega, Roksan, Sony, Arcam, Mission, Denon, Ion, Rotel. 2 single speaker dem rooms. Appts. preferred. Home trial. Free installation. Service dept. Access, Visa. Instant free credit available. 10am-6pm Tues-Sat. Sony dealer. Award nominated 86, 87, 88. BADA MEMBER 

YORKSHIRE (WEST)

AUDIO PROJECTS, 45 Headingley Lane, Leeds. (0532) 304565. A&R, Audiolab, Creek, Heybrook, Linn, Musical Fidelity, Naim, Quad, Rega, etc. Tues-Fri 9.30-6, Sat 2.30-5.30. BADA MEMBER 

ERRICKS, Hi-Fi Experience, Fotosonic House, Rawson Square, Bradford (0274) 309266. Dem facilities. Sales/service agents for A&R, Linn, Quad, Naim, Nakamichi, Mission etc. BADA MEMBER 

HUDDERSFIELD HI-FI CENTRE, 4 Cross Church St, Huddersfield. (0484) 544668. B&W, Kenwood, Denon, Dual, A&R Cambridge, Musical Fidelity, Quad, NVA, Audio Lab, Philips, Mission, etc. Dem facilities - appointment reqd. Mon-Sat 9-5.30, Thurs 9-8. Closed Wed. Free installation, credit facilities. Access, Visa.
IMAGE HI-FI Ltd, 8-10 St Annes Rd, Headingley, Leeds. (0532) 789374. AR, Audio Lab, Denon, Linn, Marantz, Meridian, Mission, Monitor Audio, NAD, Quad. BADA MEMBER 

RICHER SOUNDS, 55 The Headrow, Leeds LS1 6LR. (0532) 455717. Affordable special deals on every big budget line from Akai to Yamaha; separates & systems. City centre store opposite Lewis's. Facilities: expert

advice; free monthly Newsletters; mail order; part exchange. Mon-Fri 10-6, Sat 9-5. Access, Visa, Richer ChargeCard and cheques up to £1,000 (subject to simple clearance).

SELECTIVE AUDIO, The Forge Cottage, 19 Crossgate, Otley. (0943) 467689. Exclusively handles Alphason, Roksan, NVA, ProAc, TDL, JDI, in the area and other minimalist British designer products for the discerning listener. Dem facility. Member of the Cognoscenti. Mon-Sat 10-6.

IRELAND

CEOL PRODUCTS, 185 Lower Rathmines Road, Dublin 6. Tel: 001 975984 961358. Alphason, Audio Innovation, Exposure, Linn, Marantz, Monitor Audio, Mordaunt Short, Musical Fidelity, Rega, Roksan. Single Speaker listening rooms. Free installation. All major cards. Mon-Sat 9.30-6.00.

CLONEY AUDIO, 55 Main St, Blackrock, Dublin. 0001 889449/888477. Arcam, Acoustic Energy, Apogee, Linn, Naim, Creek, Rega, Rogers, Sony, Nakamichi. 2 single speaker dem rooms. Home trial. Free installation. Service dept. All major credit cards. Interest free credit. Tues-Sat 10-6, Thurs and Fri till 9pm.

SCOTLAND

EAST KILBRIDE


DAVID STEVEN HI-FI, 1-3 Main Street, East Kilbride, Strathclyde. (03552) 44145. Denon, Infinity, KEF, Marantz, Mission, Quad, Technics, Sony, Yamaha. Dem room. Home trial facilities. Installation facilities available. Service dept. Access, Visa. Licenced credit broker. 9.30-5.30 Mon-Sat, 5.30-9.30 Mon-Fri by appointment.

EDINBURGH


BILL HUTCHINSON Ltd, 43 Clarke St, Edinburgh. (031) 667 2877. AR, Aiwa, Denon, Dual, JVC, Mission, Mordaunt-Short, Omar, Technics, Yamaha. Dem facilities. Mon-Sat 10-6. Free installation. Instant credit. Credit cards: Access, Visa. Service dept.

RICHER SOUNDS, 1B Chambers St, Edinburgh EH1 1HR. (031) 226 3544. Discount hi-fi near the Royal Scottish Museum; affordable culture with monthly special offers on major names. Facilities: expert advice; free monthly Newsletters; mail order; part exchange. Mon-Fri 10-6, Sat 10-5. Access, Visa, Richer ChargeCard and cheques up to £1,000 (subject to simple clearance).

GLASGOW

BILL HUTCHINSON Ltd, 43 Hope Street, Glasgow. (041) 248 2857. A.R., Aiwa, Denon, Dual, JVC, Mission, Mordaunt-Short, Omar, Technics, Yamaha etc. Dem facilities. Mon-Sat 10-6. Free installation, instant credit. Access, Visa. Service dept.
STEREO STEREO, 278 St. Vincent St, Glasgow G2 5RL. (041) 248 4079. Linn, Naim, Rega, Arcam, Creek, Epos, Exposure, Revox, PT, etc. Mon-Sat 10-6. Interest free credit. BADA MEMBER 

GRAMPIAN

HOLBURN HI FI Ltd, 441 Holburn St, Aberdeen (0224) 585713. Linn, Rega, Quad, Audiolab, Mission Cyrus, Rotel, QED, NAD, Krell, Nakamichi, Denon, Sony, KEF, Wharfedale, Monitor Audio, Kenwood, etc. 9.30-5.30 Mon-Sat. BADA MEMBER 

WALES

GLAMORGAN

AUDIO EXCELLENCE, 134 Crwys Road, Cardiff. (0222) 28565. Audio Research, Dual, Krell, Linn, Magneplanar, Naim, NAD, Yamaha, etc. Closed Mon

BADA MEMBER 
AUDIO EXCELLENCE, 9 High St, Swansea. (0792) 474608. Audio Research, Dual, Krell, Linn, Magneplanar. Naim, NAD, Yamaha, etc. Closed Mon. BADA MEMBER 

RICHER SOUNDS, 5 Central Square, Cardiff CF1 1EP. (0222) 383311. From Akai to Yamaha on a budget - regular end of line special offers. Facilities: expert advice; free monthly Newsletters; mail order; part exchange. Mon-Fri 10-6, Sat 10-5. Access, Visa, Richer ChargeCard and cheques up to £1,000 (subject to simple clearance).

NORTH WALES

ELECTRO TRADER, 19 Colwyn Crescent, Rhos On Sea, Colwyn Bay, Clwyd. (0492) 48932. Ariston, Arcam, B&W, Heco, Infinity, Onkyo, Rotel, Tannoy, TDL, Yamaha etc. Dem room. Appts preferred. Home trial. Free installation. Access, Visa, American Express, Diners. 9.30-1.00, 2.00-5.30 Mon-Sat.

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 meritworthy. The Best Buy tag means that a product not only offers good sound quality but is reasonably priced as well. With source components a price limit of approximately £300 is usually used as a

guide. Recommended means that either the performance of a product is particularly good irrespective of price or, alternatively that a good value standard is achieved but overall attainment falls short of Best Buy classification. An ideal situation would be to choose suitably priced Best Buy or Recommended products from relevant categories and create a Best Buy system, but, due to the variety in tonal balance that exists in much audio equipment (especially the electromechanical elements – ie cartridge and speaker) system building is not quite that simple. These ratings make a useful guideline for shortlisting components, but only experiencing the actual combination will tell you whether it works for you.

The final column contains a reference to the issue of *Hi-Fi Choice* which featured the complete review. If you wish to get a better idea of a product by reading the complete review it is possible to order a copy (if still in print) through our back issues department. Every *Choice* issue contains a Back Issues page for this purpose.

The Directory is constantly updated with the latest reviews and price changes as well as having discontinued products removed. If a listed product is updated to a 'mark two' form and the alterations are purely cosmetic or not too extensive we sometimes leave the product in with its current model number and an asterisk to denote that it has changed since our original review was published.

SYSTEM BUILDING

Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronics giants, the hi-fi tradition of specialised separate components seems as strong as ever, and certainly represents the route taken by those who place sound quality ahead of other criteria.

Yet those who choose the 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 £420/£300	Average+ Good	The deck is warm and euphonious with high levels of clarity. Wow artefacts occasionally just audible.	3 point suspended motor unit, optional quartz PSU/speed change 13g		67
Alphason Sonata/HR-100S MCS/Atlas £720/£480/£340	Very Good Very Good	Good sound in all areas – bass, clarity and neutrality all in the top class and bettered by very few decks. Atlas PSU expensive but worthwhile	Belt drive, suspended, optional PSU. 13g	R	79
Ariston Q-Deck £165	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 Icon £215	Good Good	A thoughtful and efficient design that offers good sound, excellent value and semi-automatic operation too! Good vibration isolation eases siting	Belt drive, suspended, semi-automatic, 10g	BB	79
Ariston Forte £350	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 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 £115	Poor Average	Slated as a replacement for the CS505, the 503-1 needs careful system matching to mask rumble and microphony, but is good enough to benefit from a better cartridge	Semi auto, belt drive, low mass arm	R	55
Dual CS505-3 £139	Very Good Good	Continuous steady improvements have kept this model at the forefront of the budget market. Practicality is excellent and the deck has excellent timing bass/mid and stereo imaging	Semi-auto belt drive, 8g	BB	67
Dual CS5000 £209	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 £424/£269	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 £400	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 £699/£399	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/Akito £399	Good- Average+	A neat, attractive and well-made package which delivers a rather harsh sound with a 'one-note' effect in the bass, but it's well suited to mid market systems	Belt drive, semi-suspended, electronic PSU, 10g		79
Linn Sondek/Ittok/Troika* £549/£483/£669	Excellent Very Good	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. Arm has since been upgraded	Manual subchassis player, belt drive, 14g	R	60
Manticore Mantra/Musician £340/£170	Good+ Good+	Well engineered deck with satisfying sound. The arm is particularly fine and very good value	Belt drive, suspended, 15g	R	79
NAD 5120 £90	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 armtube/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 Continuo/Decca London International (Revised)* £599/£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	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	Manual, 11.5g	BB	48
Revolver Rebel £169	Average- Average-	Fat, assured and forward presentation, but ragged and subjective speed stability problems. With a little further development, it will be a winner	Manual, 2-speed belt drive inc cartridge, 13g		67
Revox B291* £892	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 £695, £495, £595	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
Rotel RP-855 £189	Good Good	Great sound for the money – detailed and clear with good bass and no irritating nasties	Belt drive, solid, speed adjust, 9g	BB	79
Systemdek IIX £248	Good Average+	Poised, clean sounding deck, forward and explicit in character. A good value deck under £250, and a relatively cheap and satisfactory suspended model	2 speed belt drive manual turntable and arm, 11g	R	67
Technics SLBD-22 £90	Average- Average-	Not bad for the price and a great improvement on the L20, it performs reasonably when not stretched	Semi automatic, solid plinth, electronic, 6g P-mount	R	48
Technics SL-DD33 £110	Average Average	As with the QD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 14

THE DIRECTORY

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
Technics SL-L20 £115	Poor Average-	A rather lightweight parallel tracker achieving a poor overall rating, with little to recommend it unless you dig facilities	Electronic, solid plinth, 5g, P-mount		48
Technics SL-QD33 £140	Average Average	The quartz speed controlled version of the DD is short on sound quality but not features. But it did have fair focus and some depth	Automatic, Quartz, direct drive, solid plinth, 7.5g, P-mount	R	48
Thorens TD 280 Mk II £180	Good- Good-	Legendary Thorens build quality on the cheap - slightly unobtrusive sound but eminently liveable-with and very good value	Belt drive, solid, electronic PSU, 12g	BB	79
Thorens TD 166 Mk V £200	Good Good	Classic suspended-subchassis deck with clear, stable sound of no particular character. Unlikely to make enemies	Belt drive, suspended, 12g	BB	79
Thorens TD 316 Mk II £220	Good Good-	Very solid deck with neat split-chassis construction. Sound is a bit insecure in the bass, but it could suit classical music lovers well	Belt drive, suspended, electronic PSU, 12g	R	79
Thorens TD320 Mk II £350	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
Townshend Rock Reference/Excalibur £1,800/£650	Excellent Excellent	Overall, the closest reproduction to master tape we've yet heard, with stunning real bass and excellent neutrality. Front-end damping trough improves LF detail significantly	Belt drive, suspended, electronic PSU, front-end damping, 12g	R	79
Well Tempered Turntable & Arm £1690	Average Very Good	Intriguing and challenging design. Musically it is not ideal, but it has a limpid quality and a lack of artificiality that sets standards as well as turning the ear, though it's not completely uncoloured. A charmer yet mainstream enough in its virtues to be viable	Manual 2-speed, damped, suspended arm, 7.5g	R	67
Zarathustra S4/Pluto 5A Prestige/PSU £1500/£2500/£500	n/a Excellent	The very well made and finished heavy platter S4 with the superb Pluto arm make a devastating combination ranking up there with the very best	Subchassis, manual, available without PSU	R	72

MOTOR UNITS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ariston Superior £598	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
CEC ST930 £599	Good Good++	A rarity - a serious hi-fi product that loses nothing to budget rivals in finish or convenience. Good clean sound, very stable and assured	Belt drive, external PSU, 78 speed inc.	R	79
CS Audio Resan kit for Rega £80	Good- Good	After-market kit to convert Rega 2 or 3 to semi-suspended subchassis style. Looks good and sounds tidier than original. Feedback is much reduced	Conversion kit, all work reversible	R	79
Michell Synco £265	Good Good	A particularly happy blend of qualities endows the Synchro with a blend of subtlety and force - the mailed fist in the velvet glove. Easy on the ear in the best sense	Manual, belt drive, suspended motor unit	R	67
Michell Gyrodec £595	Good Good	Sweet and natural sounding player, well exploited by the Rega RB300 arm. Aesthetics, and the acres of acrylic, are unique	Manual, belt drive, suspended motor unit		55
NVA Senior £450	Good- Average	Very high sensitivity to low-frequency vibration, especially on NVA stand, gives strange subjective bass response and confused sound. Looks are unusual but pleasing	Belt drive, electronic PSU, two-part plinth		79
Oracle Alexandria Mk III £995 - £1095	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
Origin Live Oasis B £199	Average Average+	Aesthetics are not its strong point, but its lively and articulate - if idiosyncratic - sound will please some tastes. Highly resonant construction is very sensitive to feedback	Belt drive, 33 $\frac{1}{3}$ rpm only, solid plinth/subchassis		79
Origin Live Oasis A £495	Good- Average	Rather coarse sound with lack of detail resolution - but lively presentation may appeal. Appearance is industrial	Belt drive, external mains filter, 33 $\frac{1}{3}$ rpm only, suspended subchassis		79
Oxford Acoustics Crystal Reference £2395	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 Little Pink Thing £345	Good+ Very Good	Leads the field for clarity and neutrality at this price or a good bit more. It also looks very smart! Excellent value. Arm cut-out suits Rega or Linn style	Belt drive, semi-suspended, electronic PSU	R	79
Pink Triangle PT T00 £650	Very Good Excellent	Uniquely clear sound, uncoloured, free from ringing and with good bass. Very close to master tape, given a good arm and cartridge	Belt drive, external PSU, suspended subchassis	R	79
Revolver £150	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
Roksan Xerxes £695	Excellent Very Good	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Power supply has since been upgraded - see issue 78 for our latest report	Manual, belt drive, solid/decoupled	R	67
Systemdek IIXE £248	Good Very Good	Fine, honestly specified and well built player which easily better its closest stablemate, the IIX. Frankly, at the price it's a sonic bargain	Manual 2-speed, external PSU	R	67
Systemdek IV £495	Good Very Good	The level of wow is a theoretical concern at least, but elsewhere this player shines, combining euphony, information and imaging in a polished, untemperamental package	Two-speed manual belt drive	R	67
VPI HW-19 £1,317	Very Good Very Good	Built to accommodate parallel tracking arms, this large but elegant deck produced clean, smooth sound when fitted with an SME arm. Good bass	Belt drive, suspended subchassis	R	79
Voyd Valdi £680	Good- Good+	Slight 'one-note bass' effect and lack of pitch stability compromise the performance of this well-made deck	Belt drive, suspended subchassis, electronic PSU		79
Voyd "The Voyd Plus" £2,777	n/a Excellent	Based on the standard 3-motor Voyd but with upgrade options (better bearing, platter, etc) which take it half way to a Voyd Reference, so we've dubbed it The Voyd Plus. Superb build and finish; colourful, dramatic performance. A thoroughbred	Belt drive, 3 motors, subchassis, outboard PSU	R	72

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Alphason Opal £130	Good Average	This is a straightforward adequate sounding low cost arm, priced just above where it rightly belongs	10g		55
Alphason Delta £190	Good Average+	A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz	16g	R	48
Alphason Xenon £240	Good Good+	A trimmed down HR100S, the Xenon has inferior bearings and a simpler finish, but sounds crisp and coherent. Fits any Linn cutout	12.75g	R	55
Alphason HR100S £420	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

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TO NEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Decca London International £49	Average+ Average+	This uni-pivot design gives a rather rich tonal balance and some bass muddling. Could be good with Decca cartridges, but not well built	12g		48/Summary
Eminent Technology £1000	Good+ Good++	One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound	9g (vertical)	R	48/Coll
Goldmund T3F arm £3950	Excellent Excellent	This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable	16.5g	R	Coll 2
Grace G707 £299	Good Good+	This venerable is still capable, if not competitive with modern alternatives	7g		48
Helius Orion 2 £490	Very Good Very Good	Excellently engineered with rigid bearings, free from slack. It remains expensive but the level of performance deserves Recommendation	12g	R	48
Kuzma Stogi Reference £699	Very Good Very Good	A large, solid and well-made arm that holds the cartridge firmly, giving exceptionally clear sound with just a hint of brightness	12g	R	79
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 £495	Average Good	Interesting design which works a treat on the Xerxes deck. Fits Rega cut-out. See issue 72 for up to date assessment	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 309 £495	Very Good Very Good	Beautifully made, finished and presented, this arm is fully and easily adjustable and a highly neutral performer	10g	R	79
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

* rating refers to original tested model

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
Arcam C77 £22	Average+ Average+	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal, MM	BB	48
Arcam 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
Arcam E77Mg £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
Arcam 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 £895	Good Very Good	One of the best, giving 'an extraordinarily relaxing midrange clarity', and needs a transformer	8-18g Very low, MC	R	43
Audioquest MC5 £220	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 £18	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 £31.50	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 £44.50	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 £74	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-F5/OCC LE £106	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 £265	Good+ Good+	The OC9 is better if you can afford the extra. But OC7 is at least a taste of the high-end at a sensible price	6-13g Low, MC	R	54
Audio Technica ATOC9 £400	Average+ Very Good	Tonal colours are reproduced faithfully and it rarely puts a foot wrong. Slightly less transparent than more costly MCs but it has got real wellie. Good value (really!)	6-14g Low, MC	R	60
Audio Technica ART1 £800	Good+ Very Good	This is a delicate and very fluid-sounding MC that tracks well, offers very low distortion and exceptionally good stereo separation	9-18g Low, MC	R	72

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CARTRIDGES

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 £750	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 £25	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 £50	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 £80	Average + Average +	Bearing some of the hallmarks of the '10EH, the '10LX is still less competitive in the sonic stakes	7-15g Low, MC		67
Glanz GMC20E £129	Average Average	You could try haggling but we thought the makers of this number were demanding too much lucre for their product	3-6g Low, MC		48
Goldmund Clearaudio £1500	Average + Very Good	Something of a mixed bag overall, its sonic character bears a strong resemblance to the Pradikat though it shares some of the hallmarks of the more expensive Accurate	5-12g Low, MC		60
Goldring Elan £16	Average + Average	A lightweight and frisky-sounding MM that appears to be based upon the same body as the Nagaoka mm4	7-15g Normal, MM	R	67
Goldring Epic II £26	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 Eroica L* £115	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 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 ZTE +1 £26.50	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 ZF3E + £47.50	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 Purpleheart Sapphire £799	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 £1795	Good Good	This cartridge demonstrated refined poise and a delicate but at once potent security, however, the price did seem a little on the high side compared to other Kisekis	6-16g Low, MC		60
Kiseki Lapis Lazuli £4000	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 £612	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
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 £32.50	Average Average +	Not as crisply focused as the costlier Linn magnetics, the K5 offers a smoother presentation	7-16g Normal, MM	R	67

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
Linn K9 £81	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 £465	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 £149	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 £299	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
Milltek Aurora £249	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 £349	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
Nagaoka MM4 £9	Average - Average -	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal, MM	R	54
Nagaoka MP10 £18	Average Average	High frequencies sounded "shut-in" with this spherical-stylus model, but mid and mass were energetic, bouncy and punchy	5-13g Normal, MM	R	48
Nagaoka MP11 Boron £40	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 MP11 Gold £47	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
Ortofon OM5E £15	Average - Average -	The OM10 is a hi-fi cartridge - the OM5E is not	5-16g Normal, MM		43
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 OM20 £45	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 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 £90	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 £200	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 £270	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 II* £850	Good Excellent	Quite simply, the most accurate transcription device yet created - not one for the faint hearted, Mark I version tested	6-16g V. Low, MC	R*	60
RATA RP20 £22	Average - Average	Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation	6-14g Normal, MM	R	48
RATA RP40 £44	Average Average +	The '40 did a good job of sorting out the layers and complexity of the mix, with good focus, excellent stereo spread and fine scale	6-15g Normal, MM	R	48
RATA RP70 £77*	Average Average +	Clearer and sweeter than the '40 this also seemed heavier and less lively. For £99 you can have a van den Hul stylus	6-14g Normal, MM		43
RATA RP70vdH £99	Average + Good	Able to retrieve bags of musical detail (thanks to the vdH stylus), RATA's top cartridge ranks as one of the most articulate MM's available	11-18g Normal, MM	R	67
Rega Bias £34	Average Average +	Difficult to mount in some arms due to its shallow build, the bias offers a gentile, refined SQ that certainly makes it worthy of audition	4-10g Normal, MM		67
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 £17	Average - Average	Though lacking depth, the overall sound quality was competent, but treble was not its forte	10-15g Normal, MM		43
Shure M99E £29	Average - Average -	Sister to the 92E this is a solid but not particularly exciting cartridge	5-10g Normal, MM		38 (Summary)
Shure ME75ED £26.50	Average Average -	Rather bright and splashy in the high frequencies but nevertheless a competent model	5-10g Normal, MM		38
Shure M104E £36	Average - Average	Capable in many ways, but giving no substantial improvement over the 92E in our view	5-15g Normal, MM		38
Shure ME97HE £49	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 £49	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 £60	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 £72	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

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NAME PRICE	LAB SOUND	COMMENTS	ARM OUTPUT/TYPE	VALUE	BACK ISSUE FULL REVIEW
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 £215	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 £499	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
van den Hul MC10 £499	Good Good +	A neutral balanced performer giving transparent midrange, fine depth and focus with firm extended bass. Gosh!	5-10g Low, MC	R	60
van den Hul MC One £699	Good Very Good	This extended all the positive qualities of the '10 but added greater authority and scale – worth it for the extra money	6-12g Low, MC	R	60
van den Hul MC Two £899	Good Very Good	Connected directly to any standard MM input the vdH MC Two rewards with a highly detailed yet fluid and musically convincing portrayal	6-13g Normal, MC	R	72

* rating refers to original tested model

AMPLIFIERS

The amplifier sits at the heart of the system, processing the outputs from all the various music sources as necessary and then driving the loudspeakers. These two (quite separate) functions are integrated into a single box at the low-to-middle price points; separated pre- and power amplifiers become increasingly common as one moves upmarket. At the upper end of the specialist market, valve amplifiers provide a popular alternative to the transistor types amongst enthusiasts.

There is a substantial difference between specialist (sound quality oriented) amplifiers and the consumer electronics style models. The former

are bleakly simple, avoiding all unnecessary features to provide the most direct signal path in the interests of best sound quality. The latter range from models with just basic tone controls and tape recorder switching, to those with elaborate facilities such as graphic equalisers, remote control (including volume), surround sound options etc. etc.

Lab measurement provides some useful data, particularly in regard to an amplifier's ability to drive a wide range of different types of loudspeakers, but this is only obliquely related to sound quality. We also include our measured power output (RMS, 8ohm load, 1 channel driven) – but

again, paradoxically, this doesn't necessarily correspond to the loudness capability of the amplifier, which has as much to do with the elegance of the overload characteristics within a given system (valve amplifiers invariably sound more powerful than their rating would suggest). The listing of **features** provides some indication to the complexity of an amplifier: many users prefer to retain the option of tone controls to 'shape' the overall sound according to taste; many others have found living without tone controls surprisingly easy, with additional benefits in terms of transparency

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research A03 £160	Average + Average	New slimmed down version of the A04 with less power and facilities but also a slightly 'fuzzy' sound	38W, MM disc, CD direct and 3 aux inputs		74
Acoustic Research A07 £299	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
Aiwa XA-005 £130	Good + Average –	A technically competent amp with big, friendly but not overly engrossing sound quality	61W, MM 5 line inputs, source-direct		80
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-65B £299	Good Average	On-board 18-Bit DAC's actually give better sound than standard CD inputs! Punchy via MM disc	101W, MM, 6 line, digital inputs		80
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
Amadeus Silver £270	Average – Good	Limited headroom via disc but still offers a sweet, lush sound. Limited current delivery	37W, MM/MC, 3 line inputs	R	80
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
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 Alpha II £180	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
Arcam Delta 60 £280	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
Arcam Delta 90.2 £400	Average + Average +	Dark but slightly dead or conservative sounding version of the original Delta 90. Improved disc stage	73W, MM/MC, 4 line inputs, tone bypass, bi-wire	R	74
Ariston Amp £219	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 200 £429	Poor Good + +	Like most 'Innovations valve power amps, compatibility with other brands is unpredictable. Hardly a powerhouse, but nicely 'open', transparent and dynamic sound in small(ish) systems	12W	R	77
Audio Innovations Series 300 £479	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 400 £625	Poor Good + +	Superior styling and better build quality than the Series 300 make for a very attractive integrated valve amp. Capable of fine results in the right system, but can sound too 'thin' and lacking in welly	12W, MM and 4 line inputs	R	77
Audio Innovations Series 1000/2nd Audio Amplifier £1379/2579	Poor Excellent	This valve combination offered awesome dynamic range with superb transparency and power to match. Compatibility with other brands is unpredictable	15W, MM, 6 inputs, monoblocks	R	63
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, hdpd, tone controls	R	62
Audiolab 8000A £350	Very Good Good +	Exceptionally detailed, tactile and transparent via CD but slightly more clouded via disc. A stalwart design	72W, MM/MC, 4 line and full record out selection	R	74
Audiolab 8000P £495	Excellent Good +	A dynamic powerhouse, load tolerant and sonically reliable	100W	R	62
Audion CD-1 £399	Average + Good + +	Nicely presented valve (line-only) preamplifier with fine bandwidth and enjoyable, musical sound. Great – if you can justify the cost. Well worth hearing	5 line inputs		77
Aura VA-40 £189	Average Average +	Based on ITL's earlier MA80, this amp sounded slightly withdrawn or 'dead' if inoffensive	55W, MM 4 line inputs, MOSFET output		80

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

THE DIRECTORY

AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Beard Audio CA35/P35mkII £695/£895	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 £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 £4300	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
Concordant Excelsior £856	Good + + Excellent	Cottage industry styling might not inspire confidence, but sonically this preamp is tremendously vivid and detailed. Real high-end performance. We loved it!	MM plus 3 line inputs. External power supply	R	77
Conrad Johnson PV10 £1,395	Excellent Excellent	Pricey, yes, but a fabulous preamplifier which confirms C-J's high reputation in the States. Beautiful imaging, superb detail, plenty of gain on the phono stage – classy build quality too.	MM plus 4 line inputs	R	78
Conrad Johnson MV50 £1995	Good + Good +	Coupled with the PV5, this CJ power amp performed well on audition	50W		Collection
Conrad Johnson Motif MC-8 £1995	Very Good Very Good	A cheaper alternative to the '7, this preamp is an undoubted success in maintaining the Motif sound but does not compare on sound quality	MM/MC	R	50
Conrad-Johnson Premier Seven £8995	n/a Excellent	Price has increased since we tested it – but at this price who cares? The 'Seven is designed without compromise, and it's clearly one of the finest (valve) preamplifiers money can buy Absolutely gorgeous!	MM, 4 line inputs, sep. Rec Out, versatile cartridge matching	R	72
Counterpoint SA12 £1250	Good + Good +	A real power-house power amp, beefy and load-tolerant although like the SA7 a trifle untidy at frequency extremes	100W		Collection
Creek CAS 4040 S2 £179	Good Good	More neutral than its predecessor tonally, substantial improvements in transparency were also noted, while the lively punchy, character is retained	30W, MM, 4 inputs, tone controls	BB	62
Creek CAS 4140S2 £219	Average Good	Disc headroom still poor but the open and detailed, if slightly bright, sound wins through	40W, MM/MC, 3 line inputs, mono and mute	R	80
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 Super Micro A £549	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) £850	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
Cyclone Catalyst £1995	Good + Very Good	Exceptionally load tolerant and very refined in delivery. Extra options available in future	74W, external MM or MC stages, 3 line inputs	R	80
Deltec DSP-50S DPA-50S Pre/Power £675/£825	Excellent Very Good +	Remarkable pre/power combo based around the highly linear DH-OA32 hybrid op-amp. Unmatched detail resolution, control and transparency	63W, external feedback wiring, 3 line, MM/MC no tone controls	R	68
Deltec DPA 100S £2200	Very Good Very Good	A top-quality transistor power amp, sounding fast, articulate and well controlled, though maybe a touch clinical for some tastes	80W	R	50
Denon PMA-250II £139	Good Good +	Spacious yet tactile and gutsy sound via all inputs. Worthwhile upgrade over original PMA-250	53W, MM 3 line inputs, source-direct	R	80
Denon DAP-2500 PDA-4400A Pre/Power £549/£599 pr.	Very Good Good	Denon's fully-fledged preamp also incorporates D/A converters that did not improve the sound of our £299 CD player. The power amps are brilliant!	172W, monobloks Opt/Coax dig + 2 tape, 4 line and MM/MC inputs		68
Denon PDA-6600 £1,000/pair	Excellent Very Good	Delivers abundant high quality sound, solid engineering expertise and content clearly compensating for any compromising of purist audiophile principles	250W monoblok, remote power	R	60
DNM 3A From £1000	Good + Very Good	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art preamp	5 inputs MM/MC twin vol controls	R*	44
E.A.R. 802/509mkII £1098/£1868	Average Very Good	Extremely well made and combining the sonic strengths of both transistors and valves this EAR combo warrants attention	100W, MM, 6 inputs, monobloks	R	63
E.A.R. 549 £3,298/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 £430/£470	Very Good Good	Supplied as a combination without the separate preamp power supply, this pre power combination performed satisfactorily especially on the moving coil input	50W, MM/MC, 3 inputs, straight line		62
Exposure VI/VII Dual*/VIII Pre/Power £320/£500	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. Dual version no longer available	63W, Super mod. 4 line and 2 disc inputs with full rec-out switching	R*	68
Exposure XI/XII/VIII Super £1600	Good Very Good	New preamp and improved power amp led to a smooth and refined sound, MM/MC less transparent than CD	61W, MM/MC, 5 line inputs	R	80
Grant G60AMS £948 pr	Good Very Good	This neat and compact 60W valve monoblok gave good sound on the 8ohm tap, better still on 4ohms. The midrange was particularly natural	60W monobloks 8ohms	R	57
Hafler DH120 kit form £295	n/a Fair	We didn't build one; see below	60W		44
Hafler DH-110/XL-600 £360/£1,145	Very Good Very Good	Preamp is available in kit form. Both sound remarkably open, transparent and inherently 'musical'. XL-600 is tremendously powerful and very compatible	426W in stereo mode, 1.5kW in bridge, 2mm, tone + processor loop	R	74
Hafler DH120 assembled £360	Very Good Fair	Sound quality results were decent enough, but this power amp won't set the world on fire at this price	60W		44
Harmon Kardon HK6100 £159	Good Good	Re-packaged version of the popular PM635. Still offers very up-beat and exciting sound	47W, MM, 5 line inputs, tone controls	R	80
Harman Kardon Citation 25/22 £599/£899	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

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Jadis JP30/JA30 £3,725/£1,850	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/£9900	Very Good Very Good	The technical design of these amps is very elaborate but ensures they achieve an extraordinarily transparent and potent sound. However, the CD i/p is clearly superior to the disc inputs	448W monoblok MM/MC with variable loading options. Balanced topology	R	72
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
Kelvin Integrated £395	Good+ Very Good	A true 20W Class A amp with lush, detailed and very musical sound to match. Watch out for re-style	18W, MM/MC, 4 line inputs	R	80
Kenwood KA-5500 £130	Very Good Fair	Having dropped its moving coil input, this latest version has British style dynamics and rhythm but is not first grade yet	35W, MM, 4 inputs, hdph, tone controls	R	62
Kenwood KA-4010 £170	Good Average+	A flexible design at moderate cost. Smooth and cultured sound if slightly lean in balance	81W, MM/MC, 4 line inputs, source-direct	R	80
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 £5550	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	MC (with care), passive line extra	R	60
Lectron JH50 £2,300	Average Very Good	Sexily presented valve power amplifier from France. Lovely valve sound too, with delicate and airy top end. Not especially powerful and rather expensive — but very desirable!	50W		78
Linn LK1/LK280 Pre/Power £495/£645	Good Good—	A very modern, logic-controlled amp with distinctive and inoffensive sound quality. Its restrained sound could do with extra insight and zip.	84W, compact amp CMOS sw. for 2 tape, 2 line and MM/MC. XLR sockets.		68
Marantz PM35 £150	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 PM-50 £230	Good+ Average+	One of Marantz's new breed, the PM-50 has a big and beefy sound yet one that lacks refinement	92W, MM/MC, 4 line inputs, source-direct		80
Marantz PM-75 £500	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 £1,200	Very Good Good	At 23kg the PM94 is no lightweight in either physical or sonic respects. A very powerful and comprehensively equipped amplifier	140W MM/MC tone controls (switchable)		60
Marantz PM-95 £1,800	Very Good Average+	Beautifully constructed, this amp was less convincing via its digital i/p than via line. Class A option best suited to sensitive speakers. Costly	151W with 30W available in Class A. Opt + coax inputs		74
Meridian 201/205 £599/£425 each	Very Good Good+	A fine preamp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R/—	62
Mission Cyrus One £200	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 £330	Very Good Very Good	Also a top performer in its group with fine moving coil and compact disc sound. Since our review Mission has omitted the headphone socket on the Cyrus Two	50W, MM/MC, 5 inputs, 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 B1 £200	Average+ Good+	The subject of much controversy, this 50W wonder offers a very deep, solid and powerful sound	50W, MM/MC, 5 line inputs, tape monitor	R	80
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* £349	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 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 £1,199	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 £1,399	Very Good Very Good	If the hot-box aspect is not a deterrent, this is something of a bargain. A big amplifier scale of sound which is just a little rough-edged	135W	R	50
Musical Fidelity MXV & A370 £2399/£2399	n/a Excellent	In its latest guise, the A370 confirms its status alongside the MXV as amongst the best indigenous components for both sound and presentation	MXV — 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 £339	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
NVA P70MC/A60 £830	Fair Average+	NVA's speaker cables are a must, the amp offering well-integrated but not particularly crisp sound	68W, MC, 3 passive line inputs		80
Oakley S £499	Good Very Good	Much improved version of the original Image preamp from Yugoslavia. This one won't disgrace itself even in top-notch systems. Image Six model (£100 more) is really fabulous	MM plus 3 line inputs	R	78

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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 £300	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 £115	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
Proton AP-1000/AA-1150 £250/£395	Good+ Average+	Bags of headroom available from this pre/power combo, but can seem bloated or unrefined via MM	67W, MM/MC, adjustable MC gain, 5 line inputs		80
QED A240 CD II £179	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 £239	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 £349	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 £299	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 £389	Very Good Fair	Not an impressive power amp but easy on the ear if not pushed and very reliable	100W		44
Ray Lumley Model 75 £1,995 pr	Average Good+	Monstrous valve monobloks which represent good value. What they lack in musical subtlety they make up for in sheer muscle. And these are Lumley's small monobloks!	75W monoblok		78
Revox B150 £1,047	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 £1,467	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 £395	Good Very Good	Beautifully built classy British 'hybrid' preamplifier. You can spend more to get a more transparent sound – but it's hard to criticise the Rose given the competitive price	MM plus 3 line inputs	R	77
Rotel RA810A £119	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 RA-820AX £150	Very Good Very Good	The spacious, detailed and very musical performance of this budget amp is almost too good!	47W, MM, 4 line inputs	BB	80
Rotel RB/RC850 £160/£140	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 RC-870BX/RB-870BX Pre/Power £219/£230	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 RA-840BX4 £249	Good Good+	Very sedate and controlled in presentation but must check phasing for optimum stereo effect	63W, MM/MC, 4 line inputs, passive tone	R	80
Rotel RA870BX £329	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
Solen Tiger B50 £870	Average- Food+	Stylish French hybrid with a very rich, melodic and beguiling sound. Not so hot with complex recordings	45W, optional disc, 5 line inputs		80
Sony TA-F200 £130	Average- Average	Over-ambitious protection circuit is hardly in keeping with modern amp design. Lean but 'dead' sound quality.	74W, 2 tape, 3 line and MM/MC inputs		68
Sony TA-F400 £200	Good Average+	Some lack of integration across the frequency range but still offers a more open and detailed sound than the 'F200	76W, 2 tape, 3 line and MM/MC inputs Rec-out		68
Sony TA-F530ES £300	Good Average+	Chunky UK-oriented design that offers a rich, smooth and full sound. Slight loss of focus via MM/MC disc	120W, MM/MC, 4 line sources + record out + tone	R	74
Sony TAF 500ES £349	Good+ Fair	Not too hot at the price, lacking in bass action, rating poorly on vinyl, and only marginally improving on CD	75W hdph tone controls MM/MC		50
Sony TA-F630ESD £350	Good Average	Based on the '530 but equipped with PDM D/A convertor. Amp is competent but DAC sounds truly magnificent!	130W, as above + opt. and coax digital inputs	R	74
Sony TA-F730ES £450	Very Good Good	A very stable and coherent amp but one that lacks a crucial sense of involvement	133W, MM/MC, 3 tape, 2 line, full rec-out		80
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 Athena/Polaris £695/£695	Very Good Very Good	Very good value US pre/power combo with transparent, detailed and gutsy sound via all inputs	128W, MM/MC, 2 tape and 3 line inputs	R	80
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-330e £130	Average+ Average+	An improvement on earlier efforts but still a little bland or lack-lustre. Very compatible though	48W, MM, 3 line inputs, source-direct option		80
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

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
YBA 2 pre & pwr £1395/£1695	Good + + V Good/Excellent	Superbly finished French audiophile separates, with very good space and transparency, slightly softened bass. Needs extra transformer (£300) for MC cartridges	70W MM (MC extra) straight line	R	56
YBA 1 preamp £2895	Very Good Excellent	A front line French audiophile product. Great stereo and a fine Krell style finish	MM/MC, 3 inputs, straight line	R	62
YBA 1 power amp £2995	Good Excellent	This equally well finished power amp offers front rank stereo staging and transparency, and is capable of driving the most difficult loads	85W	R	62

* rating refers to original, tested model

LOUDSPEAKERS

Last item in the hi-fi chain, to some extent the loudspeaker is merely the slave of what has gone before, capable only of reproducing a signal as good as it is fed. Nevertheless the distortions (colorations and stereo effects) introduced by loudspeakers (and rooms) tend to be more immediately obvious than those anywhere else in the chain, so careful choosing according to taste is very important.

The average loudspeaker consists of a smallish enclosure, much of which may have begun life as

part of a tree, plus a couple of drive units hidden behind a removable grille. Inside the box lurks a simple electrical circuit known as a crossover, which divides the incoming (full range) signal into the right bits for the drivers to handle. Variations on the above formula are specifically identified in the entries. The designer's primary task is to balance the **sensitivity** of the loudspeaker (how loud it goes for a given electrical input) against the **bass** extension (how low does it go) for the given box **size**. After that such subtleties as coloration and

dispersion come into the equation.

Careful **placement** of the loudspeakers within the room is as important as the initial choice of model. For good stereo they need to be more or less the same distance from nearby walls, and preferably on similar rigid stands. The listener should be about the same distance from and listening angle to each loudspeaker. The ideal **placement** depends on the way a particular model has been balanced (not to mention a number of other factors), and our recommendation is given in the entries.

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Acoustic Energy AE1 £696	Good Very Good	To the author's knowledge, the most awesomely dynamic and articulate miniature ever made	29.5 x 18 x 25cm semi-open space	88dB/W 40Hz	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 £1800 (stands £552)	Good Good	Magnificent but also seriously flawed, the AE4 possesses tremendous dynamic realism but a very mid-dominant balance. Large rooms and wallets only need apply.	54 x 32.5 x 44cm own stands in free space	90dB/W 40Hz	R	71
Acoustic Research Red Box £100	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	R	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	R	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 lift from rear wall	87dB/W 50Hz	R	66
Alexander SE5 £199	Average Average	Particularly well suited to surround sound A/V applications, the SE5 can give any miniature a run for its money on bass performance; hardness and coloration mar good detail and clarity, and price is a little high	40.5 x 12 x 15cm ALS stands near wall	82dB/W 50Hz (in room)	R	78
Allison AL105 £150	Average Average—	Pretty enough in appearance, sonically the AL105 doesn't really make the grade at the £150 asking price	37 x 24 x 21cm high stands against wall	87dB/W 45Hz (in room)	R	78
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 Amphion £680	Good Good	This fine-sounding, nicely finished compact wall-mount is just a little too expensive for formal Recommendation, but is a good performer for all that	44 x 23 x 27.5cm high stands against wall	88dB/W 47Hz (in room)	R	78
Alphason Orpheus £1000	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
Arcam Three £150	Average + Average—	Arcam's baby speaker did not delight our listeners, but it might do better in less expensive systems	34 x 18 x 23cm close to wall at head height	88.5dB/W 95Hz	R	53
Arcam Two £280	Good Average	Most things to most men this compact is unlikely to disappoint with its lively "bally" character though lacking weight... a bit	38 x 23 x 28cm near wall shelf or 40cm stands	88dB/W 55Hz	R	59
Arcam One Plus £380	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	R	59
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
B&W DM550 £149	Good + Average—	Beautifully presented, well engineered near-miniature with precise sound but a distinct lack of 'wellie'. Ideal for considerate flat dwellers	35 x 20.5 x 22.5cm stands in free space	86dB/W 70Hz	R	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	R	66
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	R	74
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	R	59
Bose Interaudio 3000XL £150	Average Average—	Lots of perceived value and well enough balanced, but low cost cabinet and driver engineering results in a crude and unsubtle sound	46.5 x 29 x 23cm stands in free space	89dB/W 45Hz	R	71
Bose 305 £350	Average Good—	A bit of an oddball, fine dynamic liveliness and a good room match more than make up for the strange stereo imaging and treble	28 x 45 x 23cm high stands near wall	88dB/W 40Hz (in room)	R	78
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	R	41
Castle Clyde £159	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 Warwick £179	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	R	66
Castle Durham £209	Average + Average	Listening results were encouraging, well engineered and finished, but lean on treble and a bit weak on bass; still recommended	41 x 21.5 x 25cm near rear wall	89dB/W 67Hz	R	46
Castle Pembroke £229	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

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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 3 £109	Average+ Average	This attractive little wall-mount gives good balance and stereo imagery, with a character which leans more towards inoffensiveness than excitement	31 x 18.5 x 21cm high stands against wall	86dB/W 55Hz (in room)	R	78
Celestion DL6 Series Two £159	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 £579	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, but 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
Duntech PCL500 Marquis £3998	n/a Very Good	Better value for money than the Crown Prince – and arguably more dynamic, with real bass 'slam' – but a little less refined in the higher registers	147.5 x 27 x 40 free standing away from walls	92dB/W 48Hz	R	65
Duntech PCL1000 Crown Prince £6120	n/a Very Good+	Immensely 'listenable', refined sounding speaker capable of creating lifesize musical images. Not overly transparent to source, but very civilised nonetheless	180 x 30.5 x 43.5 free standing away from walls	90dB/W 42Hz	R	72
Energy 22 Pro Monitor £600	Good Good	Presentation is a bit rough for the price, but this Canadian entrant is an impressive sonic allrounder that will appeal to most listeners	62.5 x 27 x 30cm stands in free space	87dB/W 40Hz	R	66
Gale 301 £300	Average Average+	Of unusual, distinctive appearance this produced a mixed response, being lively but lacking depth	44 x 23.5 x 22cm on stands quite near wall	86.5dB/W 63Hz	*	46
Gale GS402 £700	Average+ Average+	Clean but rich and powerful bass; stereo focus was not a strong point, but it is worth considering. (Recent revisions not yet checked)	61 x 35.5 x 28cm on matching stands near wall	88dB/W 48Hz	*	46
Goodmans Maxim Two £90	Average+ Average	More wham-bam-thank-you-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 B-Max/Maxim Two £90 + £90	Poor Average—	Stick with the Maxims on their own until you can afford some real grown up loudspeakers	60 x 21 x 26 + see above, suck and see	89dB/W 55Hz (in room)		78
Harbeth LS3/5A £343	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 £539	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 £159	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 120 £169	Good Average	Drab appearance belies a lively enough character, though the balance is altogether a bit bright for UK tastes	32 x 23 x 23cm high stands against wall	88dB/W 50Hz (in room)		78
Heco Interior 430s £429	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
Heco Superior 740 £599	Good Good—	A similar sonic package to the cheaper Interior 530, these Superior clothes are very pretty indeed, though spikes are still awaited	84.5 x 22 x 25cm on floor in free space	88dB/W 30Hz (in room)		78
Heybrook Point 5 £139	Average Average	"Uncouth yet still satisfying", the Point 5 gives good dynamics and bass for a compact wall-mount, but is burdened by a somewhat unhappy treble	37.5 x 23 x 24cm high stands against wall	85dB/W 32Hz (in room)		78
Heybrook Point 7 £185	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 £199	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 £255	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 £399	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 RS2001 £180	Average Average+	A little coloured and unruly in the treble, the 2001 nevertheless retains the lively dynamic bounce of its predecessor; pity the price has gone up	36.5 x 22.5 x 20cm lightweight stands	87dB/W 50Hz (in room)	R	78
Infinity Kappa 6 £795	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 £1850	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 £230	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
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 £139	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 £165	Good Good	Few grounds for criticism but purchasers should check out the treble qualities to avoid hammering the ear anvils	46 x 26 x 25cm 40cm from wall on 45cm stands	89dB/W 65Hz	R	53
JPW AP3 £219	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 C25 £139	Average+ Average—	Very safe and competent, but rather short on inspiration, the '25 lacks the brio and flair of its smaller C15 brother	34 x 20.5 x 17cm high stands near wall	87dB/W 60Hz (in room)		78
KEF C75 £349	Good Good	Compact floorstanding model's Uni-Q driver provides fine crossover integration, giving stable stereo and fine dynamic range within a slightly 'rich' balance	72 x 24.5 x 25.5cm floor in free space	90dB/W 45Hz	R	71
KEF R102 £365	Very Good Very Good	High class near-miniature with expressive, articulate midband and clean, accurate bass and top. The sound quality of the Kube circuitry, however, is suspect	33 x 20.7 x 26.3cm near wall or open on stands	89.5dB/W 60Hz	R	59

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LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
KEF C95 £599	Good Good	Rich and lazy, but nonetheless very endearing in a cosy sort of way, the '95 is a lot of speaker for the money, and delivers a big sound with grace and subtlety	88.5 x 24.5 x 31cm floor in free space	90dB/W 28Hz (in room)	R	78
KEF 103/3 £680 inc. stand	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 Kan 2 £339	Average+ Average+	A niche product for those prepared to tolerate its strong character for the sake of its fine bass performance and near invisibility	30.5 x 18.5 x 16.5cm Kan stands against wall	82dB/W 35Hz (in room)		78
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
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 £1190	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 £1998	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 MGIIIa £2700	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 £170	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	R	71
Martin Logan CLS II £3998	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 280 £340	Average- Average	Despite redoubtable build quality and good dynamics, the 280 has a rather 'obvious' mid bass and a balance that adds rather too much of its own character	44 x 27 x 29cm uncritical	88dB/W 40Hz (in room)		78
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 £130	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 £200	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 Cyrus 781 £250	Average+ Average+	Superb build, finish, presentation and engineering for the price, this romantic sounding Cyrus needs careful system matching to achieve good results	43 x 22.5 x 28cm medium stands near wall	88dB/W 40Hz (in room)		78
Mission 763 £300	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 £350 (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 £450	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 Monitor 9 £190	Good Average	Despite a much better treble balance than the 7, the Monitor 9 is less engaging and lively at low frequencies than its smaller sibling	37 x 20 x 21cm high stands near wall	84dB/W 40Hz (in room)		78
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 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 3.10 £100	Average Average+	Probably the liveliest and most communicative miniature around, this beautifully presented design is probably better suited to budget 'real hi-fi' than the blandness of the midi system	28.5 x 17.5 x 20cm high stands near wall	84dB/W 50Hz (in room)	BB	78
Mordaunt-Short 3.30 £180	Average Average+	A little too mid-forward for neutrality or formal recommendation, this attractive, good-sized model nevertheless has more than enough appealing qualities to merit serious consideration	46 x 23.5 x 27cm high stands 1-2ft from wall	87dB/W 38Hz (in room)		78
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 MS300 £319	Average+ Average+	Not considered particularly competitive in its class, though it has good power handling and stereo focus	54 x 22.5 x 25cm on stands near wall	89dB/W 65Hz		46
Mordaunt-Short 442* £1150	Good+ Good++	A resounding success with the listening panels. Make sure your room can accommodate the bass	95 x 26 x 38cm floor standing in free space	87.5dB/W 40Hz	R*	60
Musical Fidelity Reference 2 £199	Good- Good-	This compact wall-mount design with advanced drivers has good dynamics, balance and stereo, plus flashy styling and some midband 'boxy' coloration	38 x 25 x 20cm stands near rear wall	88dB/W 50Hz		71
Musical Fidelity MC-2* £299	Very Good Good++	This exceptionally clean and clear design offers real subtlety and finesse. Bass quality is light but exceptionally clear; the treble is smooth if slightly shallow	48.5 x 25.5 x 16.5cm open space and stands	87.5dB/W 65Hz	BB*	66
Musical Fidelity MC-4* £499	Very Good+ Good++	Achieving a very high standard, the MC-4 sounds detailed and coherent like the MC-2, but with more bass depth and solidity, and large image scale	56.5 x 26.9 x 29cm open space on stands	87.5dB/W 60Hz	R*	59
NVA Cube 1 £600 (stands £200)	Good- Good+	Attractive, cube-shaped semi-omni is very sturdily built, and gives an idiosyncratic but unusually open, spacious and informative sound	33 x 32 x 32cm own stands c0.5m from wall	85dB/W 52Hz	R	71

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
NVA Cubix £1,100	Average Good	Too idiosyncratic for formal recommendation, the Cubix possesses remarkable bass extension for its size, but is tricky to optimise and has some aggressive tendencies	60 x 32.5 x 32.5cm low stands against wall	88dB/W 20Hz (in room)		78
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
Opus 3 Capella £599	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
Pearl & Oakley Victoria 200 £1099	Average— Average—	Extraordinary – and to many very attractive – ‘ginger jar’ presentation in Staffordshire ceramics, but let down by need for further acoustic and mechanical development	93 x 33 x 33cm on floor in free space	87dB/W 30Hz (in room)		78
QLN Signature £1,100	Good Good	Beautiful but expensive luxury compact has a rather laid back and ‘heavy’ sound, but coloration is low and stereo imaging very good	37 x 18 x 36cm heavy stands in free space	83dB/W 30Hz (in room)		78
Quad ESL-63 £1690	Good+ Good+ +	With its unusual but subtle characteristics this classic electrostatic may not be punchy in the bass, but has strengths that some cannot live without	92 x 66 x 27cm open stand well clear of wall	84dB/W 34Hz	R	60
Richard Allan CD5 £184	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 LS4A £219	Good Good—	This artfully voiced and well balanced compact gives a fair flavour of the classical ‘BBC sound’ at a very reasonable price	43 x 25.5 x 24.5cm stands 1ft+ from wall	87dB/W 32Hz (in room)	R	78
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 £579	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 £140	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 £115	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
Royd Apex £485	Average+ Good	Not the smoothest sound around, it more than compensates with an impressively communicative and informative musical presentation	85.5 x 20 x 30cm on floor close to wall	87dB/W 33Hz (in room)	R	78
Ruark Swordsman £219	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(ish) room and has a sting at the top, but the transparent dipole midband provides an unusually open and dynamic sound	102 x 35 x 25cm spiked, in free space	86dB/W 45Hz	R	71
SD Acoustics SD1 £1150	Average Very Good	A large scale, airy and unusually detailed system with excellent dynamics. Current model has more civilised top-end and warmer balance than original model	123.5 x 38.2 x 31.9cm free space	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		71
Snell Type C £2350	n/a Very Good	Pricey, yes, but an extremely capable loudspeaker. Musical and transparent; excellent bass extension	112 x 38 x 33 free standing away from walls	90dB 35Hz	R	65
Sony APM-101ES £100	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-141ES £200	Average Average	A great deal of loudspeaker for the money, the rich-sounding ‘141 needs a big room and still shows significant ‘loudness’ (boom n’ tizz) tendencies	61.5 x 26 x 32cm large room, free space	88dB/W 30Hz (in room)	R	78
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 SP2/2* £500	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 £800	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
Spica TC50 £599	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 £799	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 £1295	Good Average	A little bass shy and soft in the bass and lower mid, the free standing Angelus is otherwise tidy, extremely lively and fluid, if uneven overall	116.8 x 53.3 x 26cm away from walls	86.5dB/W 50Hz		60
Studio Power Sapphire £120	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
Sugden CL £275	Average+ Good—	A thoroughly impressive and likeable near-miniature, the CL is prettily and properly built, and needs a good driving amplifier	35.5 x 18 x 26.5cm high stands in free space	86dB/W 35Hz	R	78
Tannoy M15 £170	Good Average+	Somehow lacking the magic of its predecessors, the M15 remains a fine value compact that needs careful set-up to give optimum results	50 x 25 x 21cm Blu-tack to stands 1-2ft from wall	88dB/W 40Hz (in room)	R	78
Tannoy DC1000 £200	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 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 DC3000 £600	Good Good	Giving new meaning to terms like dynamic range and headroom, the magnificent ‘3000 is a must for those who enjoy high-level monitoring. But spare a thought for the neighbours	94 x 26 x 31cm floor 1ft+ from wall	94dB/W 30Hz (in room)	R	78
Tannoy Westminster £3600	n/a Good+	These awesome horn loaded speakers are remarkably controlled and impressive, if only suited to a few pockets and rooms	Huge, flat against rear wall, away from corners	96dB/W (manuf.)	R	Coll
TDL Studio 1 £549	Average+ Good	Delivering genuinely extended bass from a compact floorstanding enclosure, the Studio is very detailed but a shade clinical and detached in presentation	76 x 23 x 33cm low stands in free space	84dB/W 25Hz (in room)	R	78
TDL Monitor £1799	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 £140	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

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MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
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 £100	Average Average	Providing a benchmark for budget loudspeakers, this Toshiba-inspired but UK designed and manufactured model is a lot of loudspeaker for the money, if a shade on the cheap	40 x 26 x 21.5cm stands in free space	86dB/W 55Hz	BB	68
Townshend Glastonbury IIS* £1700	n/a Very Good	What? No bass? Actually, like the KEF 107, Glastonbury II goes down so low you might not notice how good it is. A truly remarkable performer. Superb soundstaging	91.5 x 28 x 46 free standing in room corners	88dB 27Hz	R*	65
Videotone Minimax 2 £80	Poor Average—	Cheap in build and QC as well as price, but cheerful (if coarse) with it – if a little too cheerful after extended listening	27.5 x 17 x 20cm near rear wall	84dB/W 90Hz	R	74
Visonik David 6001 £173	Average— Poor	Sharp styling a classy looking miniature makes, but the complex grillwork worsens a sound which starts off with too much top and not enough bottom	20 x 12 x 13cm against rear wall	87dB/W 130Hz		74
Wharfedale Delta 30 £80	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 £100	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 III £100	Below Average Average—	This latest version of the long running Diamond sports a better tweeter, but bass, though deep, is soft, and the midband is indistinct and uneven	24 x 18.5 x 20.5cm near wall, stands	86.5dB/W 75Hz		59
Wharfedale Super Diamond £140	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 £150	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 £180	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 507 £220	Average + Average—	Generous in size but uningratiating sonically, the 507 doesn't seem to gel in the way the smaller 505.2 does, finding a good in-room balance difficult to achieve	49 x 25.5 x 29.5cm high stands 1ft+ from wall	86dB/W 35Hz (in room)		78
Yamaha NS 1000M £900	Good Good +	Living up to its monitor label, and tonally well suited to digital material, the NS 1000M is superbly crafted and capable of high levels	67.5 x 37.5 x 32.5cm 30cm from wall, stands	90dB/W 40Hz	R	46

* rating refers to original, tested model.

CASSETTE DECKS

The bad odour of copyright theft hangs around the compact cassette, but there is no doubt it is the world's most versatile and ubiquitous music storage medium. Hi-fi buffs may wrinkle their noses pointedly, but are still happy to use cassette decks to make up tapes for the car or personal – at the same time complaining loudly about the quality of pre-recorded material. (In fact the very best decks can do a surprisingly good job with musicassettes.) There is no problem in connecting a cassette deck to any normal amplifier, but some care needs

to be taken in choosing the best tapes for a specific machine. (Trial and error is one effective technique, but many decks have manual bias adjustment and some match up to the tape automatically.) Lab performance and sound quality often go hand in hand, and are frequently somewhat dependent upon factory alignment. The mechanical integrity of the mechanism itself is another crucial factor, that is often reflected in the asking price. All modern hi-fi decks have Dolby B and the majority have Dolby C besides; the very worthwhile

HX Pro system is becoming steadily more widespread. Remote control remains rare, though sometimes it is available as a system option. Three-head recorders allow simultaneous checking of the recording being made. Auto-reverse is a useful convenience feature, but usually with some mechanical compromise, while double-mechanism 'dubbing' decks of dubious quality are fashionable at the bottom end of the market. The welter of different 'music search' systems available is some indication of their frequent ineffectiveness.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research RD-06 £280	Average Average +	Acceptable middle market player with very simple facilities and cramped control section, but unusually good looks	Dolby B/C HX Pro, fine bias, counter memory, repeat		69
Aiwa AD-F270 £90	Average Average +	An excellent budget machine, adequately equipped and satisfactorily built. Sound quality is in severe danger of transcending the price category	Dolby B/C, fine bias adjust	BB	75
Aiwa AD-F370 £130	Average Average	Adequate but uninspiring recorder with detail shortcomings but good control layout and successful sounding with recorded musicassettes	Dolby B, C, HX Pro, bias adjust		63
Aiwa AD-R470 £150	Average Good	For once, an auto-reverse deck with the performance of a decent unidirectional one at a similar price. The Aiwa is modern in concept and execution, and has good, transparent electronics	Dolby B/C/HX Pro, auto reverse, cue & review, bias adjust	BB	69
Aiwa AD-WX777 £179	Very Good Very Good	Excellent, middle price dual deck with quick side change and a living, breathing sound – though prerecorded tapes sound bright	Twin auto-reverse, one records. Dolby B/C, fine bias	BB	75
Aiwa AD-F700 £199	Good Average—	Somewhat less than the sum of the (most fine) individual parts, this deck has an artificial quality which spoiled the efforts of a fine transport	Dolby B/C/HX Pro, fine bias, CD Direct input		75
Aiwa AD-F800 £249	Good Very Good	Close to first class performance – and superb value. The Aiwa is purposeful and finely engineered. It provides a near irresistible blend of good mechanics and electronics	3 head, dual capstan, Dolby B/C/HX Pro, tape calibration	BB	75
Aiwa AD-WX888 £249	Good Good	Inaccurate set-up spoils metal tape operation, but with other tapes the deck works well. This deck offers fine engineering, facilities and sound	Dual auto-reverse twin deck, Dolby B, C and HX Pro	R	75
Aiwa XK-007 Excelia £400	Good Good	Downmarket version of XK-009 with simplified bias/equalisation adjustment section and more forgiving but less informative sound. Still good, but less exciting than XK-009	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment		63
Aiwa AD-WX909 £400	Good Good	Convenience meets sound quality, and both win. An essentially clean, positive recorder which works alongside an auto-reverse player of lower standard – a sensible compromise	Dual deck, auto-reverse, track search, Dolby B/C/HX Pro, bias adjust, 3 Head	R	57
Aiwa XK-009 Excelia £550	Very Good Very Good	Excellent detail, stable articulate midband and slightly obvious treble. The most interesting Aiwa for yonks	Dolby B, C, dbx, HX Pro, 3 Head, tape alignment, CD direct	R	63
Akai GX-32 £170	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 £250	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

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai GX-65 £299	Poor Poor	Uneven sounding deck with poor bass reproduction and dynamics. A pity this, because the deck looks and feels good	3-head, Dolby B/C/HX Pro, optional remote		81
Akai GX-6 £330	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 DRM-400 £130	Poor Poor	Messy, confused sound terminally lacking in detail and space under all conditions of use due to high mechanical flutter levels.	Dolby B/C, memory stop, track search		81
Denon DRM-500 £170	Good Very Good	Powerful, refined and detailed sound, and an excellent transport are keys to the success of this cleanly styled addition to the range – but why no timer standby?	Dolby B/C/HX Pro, variable bias	BB	75
Denon 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 DRM-700 £240	Good Very Good	Stoppily executed (though attractive) user interface contrasts with a high standard of music making belying its modest price	3 head, Dolby B/C/HX Pro, record return	R	81
Denon DRM-800 £299	Good Very Good	There are some niggling faults and limitations (no timer standby is particularly annoying), but as a means of recording music it sets a very high standard	Dolby B/C/HX Pro, off tape monitoring, dual capstan	R	75
Denon DR-M34HR £320	Very Good Good+	Prerecorded cassettes sounded grey and dull, but this may have been a sample fault. As a recorder, the DR-M34 is refined and detailed – and good value	Dolby B, C, HX Pro, 3 Head, manual tape calibration, memory counter		63
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 £130	Average+ Poor	Uneven, unstable sounding player with limited resolving power, but good control layout and finish	Dolby B, C, HX Pro, intro scan		63
Kenwood KX-3010 £170	Average+ Average	Minor ergonomic shortcomings notwithstanding, this is a workmanlike deck that only misses recommendation due to an azimuth problem leading to very dull sound with prerecorded tapes	Dolby B, C, HX Pro, auto bias		75
Kenwood KX-4520 £260	Good+ Very Good	Some high frequency Dolby misalignment and obscure minor functions aside, this is a vital and engaging performer	Dolby B/C/HX Pro, 3 heads, various search functions	R	81
Kenwood KX-5010 £270	Very Good Excellent	This important new middle price deck is a well thought through and thoroughly developed design which eschews gimmicks for the sake of musical excellence	Dolby B/C/HX Pro, auto tape calibration, track/intro search	BB	69
Kenwood KX-9010 £400	Very Good Average+	Clean, detailed but flat and overtly hi-fi-ish sound quality makes the 9010 a little less than the sum of its parts	3-head, auto tape calibration, Dolby B/C/HX Pro, remote control		75
Marantz SD-40 £170	Average Average-	Transistory sounding electronics mar a basically good recording machine. Prerecorded material suffers from effects of Dolby pumping	Dolby B/C/HX Pro, bias adjust		81
Marantz SD-50 £220	Good Very Good	Fine, exacting all-rounder offering good stereo, precision and focus. Good with prerecorded tapes too.	Dolby B/C/HX Pro, track & intro search, variable bias etc	R	81
Marantz CP230 £300	Average Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, bias adjust	R	52
Marantz SD585 £300	Average Average-	Sound quality is a little sat upon, and control ergonomics are somewhat opaque, though the twin auto-reverse/recording capability makes this a powerful machine	Dolby B/C, twin auto-reverse & record, parallel recording etc		69
Marantz SD-60 £350	Good Very Good	A first rate, highly capable deck offering energetic yet refined sound largely due to good electronic design	3-head, Dolby B/C/HX Pro, variable bias & sensitivity	R	81
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 FC870 £250	Average Average	Disappointing at the price, this is a well equipped deck with off-tape monitoring, but a somewhat listless, smeared musical style	Dolby B/C/HX Pro, 3-heads, track/intro search etc		81
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-225 £100	Average+ Average-	At last – a cheap Pioneer with auto-tape select! Well specified ultra cheapie, but poorly set up, especially for commercially recorded material	Dolby B/C, track search		81
Pioneer CT-335 £150	Average Average	Mostly satisfactory mainstream deck, at its worst with prerecorded material which sounded edgy. It made very good Type II recordings	Dolby B/C/HX Pro, track search		81

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NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Pioneer CT-445 £180	Good Good	Exactingly engineered and fine sounding deck with a strict emphasis on function. Best with good Type IIs	Dolby B/C/HX Pro, electronic counter	BB	81
Pioneer CT-656 £250	Good Good	Well conceived and executed low cost 3-head recorder. It benefits from and makes good use of metal tapes, but is never less than couth and stable sounding – even with ferric tapes	3 heads, off tape monitoring, fine bias, Dolby B/C/HX Pro	R	75
Pioneer CT-737 Mk II £350	Good Average+	Easy to use and sensibly equipped, the CT-737 is much improved, but sound quality is still a tad lacklustre	3-head, Dolby B/C/HX Pro, manual record bias/sensitivity		75
Pioneer CT-91a £500	Very Good+ Very Good+	Superb, near state of the art recorder with an excellent dual capstan transport and very capable electronics. At the price, this one is a mould breaker	3-head, tape calibration, Dolby B/C/HX Pro	R	75
Revox B215-S £1,826	Very Good Very Good+	This is a superbly engineered deck with a classically fine performance that almost transcends the stereotypes. Ergonomics are flawed but the user interface is both powerful and flexible	3-head, dual capstan, Dolby B/C/HX Pro, auto calibration	R	75
Rotel RD-845 £130	Below Average Good/Poor*	Extremely fine transport and clean sounding electronics for the price. Bass lacks weight, but deck works remarkably effectively with chrome tapes. *See text	Dolby B/C, manual tape selector	R	81
Rotel RD-865 £200	Good Very Good	Fine, architecturally solid sound quality in a package with a low gimmick count and strong audiophile appeal	Dolby B/C/HX Pro, fine bias	BB	75
SAE C102 £549	Average+ Good	Looking most unlike a cassette deck designed in the States and proving competitive in its price group. Not sonically that outstanding, however	Real-time counter, track search, Dolby B & C		52
Sansui D-X301i £180	Average+ Good	Lively, informative and well equipped basic deck, if rather obscure operationally	Dolby B/C/HX Pro, variable bias, track search	R	69
Sansui D-X501 £230	Poor Poor	Unhappy mixture of good looks, excellent ergonomics and mediocre, sometimes poor sound	Dolby B/C, random track search		81
Sansui D-X701 £340	Average Average	A little flat and smeared under some conditions, this design is at its best with metal and prerecorded tapes	Dolby B/C, 3-head, variable bias & output, track search		81
Sony TC-FX110B £90	Poor+ Poor+	Woolly bass and scrappy treble combine to make a meal of many music types, despite accurate response shapes with most types of tape. Prerecorded material sounds dull	Dolby B/C		75
Sony TC-TX55 £150	Average Average+	The sound quality ranking is a good one for an auto reverse machine at this price level. Clean, sharp sound, only slightly let down in the deep bass.	Auto reverse, Dolby B, C & HX Pro	R	75
Sony (WMD6C) ProWalkman £249	Good+ Very Good	"One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket"	Dolby B, & C	BB	60
Sony TC-RX60ES £250	Average Average	For once a stable sounding auto-reverse deck but sound quality is rather 'dirty' and compressed, especially with Dolby C	Auto-reverse, Dolby B/C/HX Pro, auto tape recognition		63
Sony TC-K630ES £300	Average- Average	Acceptable-to-good sounding deck despite some measured shortcomings. At its best with metals; lacks vitality with lower bias tapes	3-head, Dolby B/C/HX Pro, bias adjust		81
Sony TC-RX80ES £350	Average+ Good	Clean, powerful and detailed sound, especially without Dolby C. Stable pitch – but prerecorded cassettes sounded disappointing	Auto reverse, Dolby B/C/HX Pro, bias/level adjust	R	63
Sony TC-K730ES £500	Very Good Very Good+	First rate cassette deck that scarcely betrays it is a cassette deck on audition. Features and control wise, it feels a little dated	Dolby B, C, bias and equalisation adjust	R	81
Teac V-270C £89	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-480 £129	Average Average+	A rather utilitarian model, the V-480 just makes it on to our recommended list by virtue of a clean, open sound that to an extent transcends the measurements	Dolby B/C/HX Pro, fine bias	R	75
Teac W-470 £129	Average- Average	A low grade transport is allied to respectable electronics to give sound quality ranging between acceptable and good. Prerecorded tapes sound bright	Twin deck, one records, Dolby B/C, intro-search		75
Teac V-870 £349	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 £449	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 £445	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 £489	Very Good Average	Superbly equipped, yet usable – and well built too. But sound quality is something of a disappointment at this price level, being appropriate for a model about half the price	3-head auto-reverse, tape calibration, Dolby B/C/HX Pro/dbx		75
Technics RS-B555 £160	Good+ Good+	Very good value. Resolution, stability and quality of set-up are strong points, a slightly strained, synthetic quality is sometimes apparent	Dolby B/C/HX Pro, bias adjust, track search	BB	81
Technics RS-TR255 £160	Average Average	Neat, sensibly designed middle of the road dual transport recorder, suitable where the ability to dub tapes is a particular priority	Twin transports, one records and auto-reverse, Dolby B/C	R	75
Technics RS-B655 £200	Good Very Good	Excellent middle price deck, well equipped with a not over-refined but highly articulate and crisply defined style of musical presentation	Dolby B/C/HX Pro, bias adjust, track search	BB	81
Technics RS-TR355 £200	Average Average	Serviceable middle market dual deck without serious fault but with some annoying inadequacies, notably an inability to play side A and B and then stop	Twin auto-reverse, one records, Dolby B/C/HX Pro		75
Technics RS-TR555 £300	Average+ Average	Sound quality varies with mode of use, but is rarely less than competent, and is often highly enjoyable. dbx is best avoided	Dual auto-reverse/dual record/Dolby B/C/HX Pro & dbx	R	81
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
Yamaha KX-230 £140	Average+ Average+	A strong near-budget performer, the strengths include good overall sound, excellent search aids. Weaknesses: ergonomics, soggy bass with prerecorded material	Dolby B/C/HX Pro, variable bias	R	75
Yamaha KX-300 £160	Average+ Average-	Uncommonly well equipped and adequately made and presented, this model turned out to be a disappointingly uncertain proposition on audition	Track search, Dolby B, C, HX Pro with 'play trim', bias adjust, remote control		57
Yamaha KX-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-630 £300	Good Very Good	Well equipped and immaculately presented, offers fine, articulate music making with a bias towards high bias tapes, especially metals	3 head, Dolby B/C/HX Pro, optional remote	R	81
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

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THE DIRECTORY

DAT RECORDERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa Excelia XD-001 £1300	Very Good Very Good	Clear and very listenable recorder roughly comparable to but slightly sweeter sounding than the Sony DCT-1000ES – but with an inferior front panel design	Track ID and search, remote	R	63
Grundig Fine Arts DAT-9000 n/a (system component)	Good Good	Conventional DAT recorder offering standard facilities. The deck is well made and equipped, and is engineered to a satisfactory quality standard. It performs to an acceptable standard, though it is not state of the art	2/4 hour recording, mic inputs, digital in/out		69
Luxman KD-117 £1499	Good Good	Slightly soggy, earth-bound sound quality, this model trails the other DAT decks tested so far	Two analogue inputs, remote twin address		63
Sony DTC-M100 £799	Very Good Very Good	Clean, clear sounding 2nd generation model with most of the features and sound of the DTC-1000ES	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 most 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 XC-005 £280	Average Average+	Very comprehensively equipped including double digital and audio outputs. The average performance was still sufficient for recommendation at this price	Power vol, edit-dubbing, shuffle 2 digital op	R	76
Aiwa CD-001 £300	Good Good	Pretty close to Recommendation, delivering a respectable sound quality and lab performance from an ergonomically attractive package, but ultimately failed to excel in any particular respect.	Track entry/volume remote, direct recorder connection etc.		58
Aiwa XC-007 £499	Very Good Good	Creditable sound despite inverted output, high tech engineering with very good lab performance. A worthy contender but not cheap	Remote, keypad, timer, digital output, pseudo 20 bit, dual DAC		64
Akai CD-52 £249	Good Good	A nice surprise from Akai, genuinely good sound from this mid-priced model. Better linearity will help further	Remote, digital output, headphone socket	BB	64
Akai CD-62 £330	Fair Very Good	Looks, build quality and the technical specification are right up to date. As it stands it sounds very good but if the indifferent lab performance could be improved, it would probably sound even better.	Remote, programme, hdph, comprehensive display etc	BB	70
Akai CD-73 £450	Good Average	A little uneven musically, the Akai tends to smother fine detail, but has first class dynamics and stereo imagery. Worth auditioning	Track entry keypad remote, menu display (switchable)		62
Akai CD93 £700	Good Very Good	Undoubtedly a CD player of real class in build, presentation, lab performance and sound quality, but also a shade expensive for formal Recommendation – though that's not to dissuade lovers of black lacquer wood finish.	Track entry remote, menu display etc.		58
Arcam Delta Black Box £250	n/a Very Good	This rich, powerful and articulate sounding DAC transforms the majority of medium price CD players	Needs D-out CD players	R	60
Arcam Black Box II £299	Very Good Very Good	An addition to the BB I, it also offers improved sound and more inputs	Optical and wired input digital decoder	BB	76
Arcam Delta 70 II £600	Very Good Good	Now in Mk II form a further improvement is seen in features, performance and sound quality. Solidly built and British	Now adds simple remote vol + std features; also display off	R	76
Arcam Delta 170 Transport £599	Very Good Very Good	While no bargain, this is a well made metal boxed transport providing clean digital data for onboard decoder/processors	Transport only, display off, usual programming	R	76
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
Carver TL 3100 £340	Average Average-	The sound quality did not live up to the excellent fascia. Carver's DTL did not aid the indifferent sound	DTL sound shaping, usual facilities, remote, memory		76
conrad johnson DFI £1,995	Average- Good+	Setting a decent standard and including an FET line preamplifier, the unusual DFI is worth investigating	Line preamp built-in, simple remote facilities		76
dbx DX5 £640	Good Poor	Sound quality proved a single disappointment, though it's refreshingly unique in providing semi-pro post-production facilities that some users will undoubtedly relish.	Track entry/volume remote, compression, impact recovery, ambience etc.		58
Denon DCD 610 £200	Good+ Fair+	Lots of Denon player for the money, well equipped with good all round performance	Remote, versatile programming 2x 0/S	BB	64
Denon DCD820 £249	Average+ Average-	A powerful combination of features and build for the money ensures recommendation. The sound is just good enough	Well equipped, power vol, edit etc, digital out	R	76
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 DCD1420 £400	Very Good Average	Superbly equipped with a fine lab performance, this modern player needs a touch more sonic spice to get recommended	20-bit, very comprehensive, remote, power volume etc		76
Denon DCD-1500II £500	Very Good Very Good	The extra build quality over cheaper Denons is justified in terms of sound quality and lab performance, while the feature list is comprehensive and quite nicely presented	Track entry/volume remote, menu display etc.	R	60
Denon DCD-1520 £500	Very Good Very Good	High tech, high profile, high gadget content, good sounding player at an almost affordable price	Programme, hdph socket, remote, track entry, optical digital output	R	70
Denon DCD 1700 £650	Good+ Very Good	The overall sound was strong and coherent approaching reference standards. Fine build quality and facilities make this a firm contender	Remote, skip, scan, headphone socket, programmable	R	58
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

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Denon DCD-3300 £1200	Good + + Very Good	Sounding tight and coherent though not significantly better than the cheaper 1700. Very well built and comprehensively equipped	Remote control, with volume, keypad programme, scan, search, headphone		51
Dual CD 1030 RC £170	Fair Fair	An up and down performance on test but it is hard to deny the overall value for a machine that includes remote control at this price	Remote, headphone socket, 2x 0/S, timeshared 16 bit	R	64
Ferguson CD007 £130	Good Fair	The cheapest recommendation in the test group; don't expect the earth but the value is good	Manual, digital output, headphone socket	R	64
Ferguson CD008 £150	Fair Fair	Not as strong as its relatives, sample fault perhaps? Though performance is fair enough overall	Remote, midi digital output, 2x 0/S, timeshare 16 bit		64
Goodmans GCD300 £129	Average Average	It may be adequately made, but with cheap good sounding players available this particular Goodmans isn't quite good enough	Programmable, skip, search, repeat		70
Goodmans GCD550 £199	Average + Fair +	A slow autochanger with a weakish lab performance but the sound is fair enough, the features good and the price is low	Remote, 6 disc autochanger, 2x 0/S	BB	64
Goodmans GCD555 £219	Average Average -	Scores approval on grounds of low price. You must pay more for better sound and a faster mechanism	6 disc changer, 32 track memory, remote etc	R	76
Grundig CD9000 £1000	Good Good	Aimed at a market which puts external styling above sound quality. Although this player is of slightly above average competence in most departments it is expensive	Remote, programme, hdph socket, calendar display etc		70
JVC XL-Z1010 £499	Good Average -	Despite some high tech design and a good lab result this model did not deliver good sound quality	32 track prog., disp off, auto fade, 2 digital op		76
Kenwood DP-8010 £449	Good Fair	Top build quality and novel technological features seem to achieve little success here. While the technical performance is fine, the sound quality doesn't match its competitors	Track entry remote, memory display, sprung feet, optical digital output etc		70
Luxman D-90 £300	Fair Good	Despite technical ingredients that do not seem particularly inspiring, this is a nicely judged package that is ergonomically neater than most, with decent sound quality for the price and distinctive finish and presentation.	Track entry remote, programming etc.	R	58
Marantz CD583 £169	Very Good Good	Devoid of all but the CD essentials it makes up for in sound quality what it lacks elsewhere	Memory, track skip, search, etc	BB	70
Marantz CD85 £500	Very Good Very Good	This player may just miss a top sonic rating but it's well made and has plenty of features befitting a Marantz heavyweight	FTS, key pad remote, comprehensive display, programming, optical output etc	R	70
Marantz CD94/CDA94 £1600	Very Good Very Good +	This two-box combination delivers reference standard lab and listening test results, albeit at a price which seems a little steep. Very refined	Favourite track selection, remote, balanced output etc	R	60
Marantz CD12LE £2800	Very Good Excellent	This top of the range two-box player may be very expensive but it is very well made. Technical performance is very good and the sound is the best from Marantz yet	Two box, digital processor, FTS, optical connection, hdph socket, comprehensive display, balanced output etc	R	70
Meridian CD207 £1050	Very Good Excellent	The 207 matures with age and in its present form it offers one of the best sounds around plus great packaging and versatility through its preamp options	On-board preamp, options, two box, coax digital output, remote	R	72
Micromega CDF1 Classic £1400	n/a Very Good	A very well made and stylish player from France, the CDF1 is a CD player for analogue lovers or as close as we've come across	Basic remote, digital output, suspended chassis	R	72
Micro Seiki CDM100 £3850	Very Good Good	One of the hernia inducing bricks of hi-fi, the Micro is extravagantly styled, finished and built. The good lab performance led to an 'only good' sonic display when the price demanded excellent	Balanced output, remote, display blanking		72
Mission PCM2 £500	Good + Good	A matured design with good features it is the best sounding power volume player available, it even tests well. It accepts the £200 PSX power supply option	Remote volume, display and phase invert	R	64
NAD 5320 £169	Average - Average -	A low cost player devoid of features but at this low price it should still offer better sound	Budget facilities, 20 track program		76
NAD 5220 £230	Average - Poor	Conforms sonically to a stereotype of the medium that most players have grown out of. Hard, thin and raw sound with poor stereo and resolution.	Time/track display, memory		62
Nakamichi OMS-1E £395	Good Good	This neat enough player doesn't really follow the Nakamichi tradition of providing exceptional sound quality while at the same time perpetuates that of selling at an above average price	Simple remote etc.		58
Nakamichi CDP-2E £495	Very Good Good	It's ergonomically superior and has above average sound, but it isn't cheap. The standard of build quality and finish is first class which isn't quite matched by the sound quality	Programming, hdph, remote track entry, digital output		70
Nakamichi OMS-4E £1200	Very Good Very Good	Solidly controlled and comparatively simple this clearly represents one of the major benchmarks for CD sound quality, though the midrange sounded a touch thin	Skip and scan, headphone socket		51
Nakamichi OMS-5EII £1500	Good + Very Good	"... delivers near state of the art performance and build quality in a deliberately starkly functional package, but at a very high price ..."	Skip and scan, simple track programming, manual control		51
Nakamichi OMS-7EII £2000	Good + Good	The only serious criticism here is of the price. And in our not always humble opinion you can get better sound quality for less elsewhere in Nakamichi's range	10 digit track entry keypad programming, headphones		51
Onkyo DX-1500 £170	Average Fair	Ruled out on the grounds of its poor DAC filter, but it's not so bad really given the price	Manual, 2x 0/S, timeshared 16 bit		64
Onkyo DX-3500 £250	Very Good Fair	It offers a lot of facilities and fine build quality for the money. Lab performance is very good but the sound quality doesn't inspire	Key pad remote, memory, hdph socket, comprehensive display etc		70
Onkyo DX-7500 £450	Good Very Good	This comes close to the state of the art performance in many areas. It has lots of facilities and is well made too.	Key pad remote, memory, hdph, very comprehensive display, optical digital output etc	R	70
Philips CD610 £160	Average + Average	Built down to the price the sound is OK while the package performance and features constitute fine value	Remote, hdph, programming etc	BB	76
Philips CDC875 £300	Average + Average -	The changer works well and this machine is very well equipped. The sound quality is below par but may not matter too much in its likely 'muzak' application	6 disc changer/dig op remote, hdph, memory, shuffle		76
Philips CDV185 £350	Average + Average	Hard to value with the video singles facility but it all works well enough for a recommendation	Video singles + CD scart + digital out etc	R	76
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 PDM710 £350	Good Average	A fine multi-changer with excellent memory programming; fully featured, sounds fine but no digital output	6 disc changer, 40 track memory + multi memory full remote, hdph, etc	R	76
Pioneer PD9300 £450	Excellent Average	A mid price flagship of excellent build and lab performance but only average sound - interesting though	Remote, 24 track programming, 2 digital op		76
Pioneer PD-91 £800	Excellent Very Good +	Close to state of the art in nearly all areas - soundstaging, clarity and simple lack of artificiality. A well made and sophisticated player	Track entry remote, calendar display, index search, etc.	R	64
Proton AC-120 £180	Average Average -	Fine styling, low price but barely average performance	15 track memory, simple design, remote, hdph		76
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
Revox B226S £840	Good Average	Top quality build and finish for the Revox system enthusiast. For high value sound look elsewhere	Remote vol, hdph, 19 track memory, digital op		76

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CD PLAYERS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
Rotel RCD855 £250	Good Good+	Stripped for action this well built Philips technology player delivers fine performance and sound. First rate value	Remote, 20 track prog, 1 audio op, 1 digital op	BB	76
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 CDP-228ESD £400	Very Good Average+	Good value, this is Sony's best mid price design and comes superbly equipped	hdph, remote, rem vol, custom file	R	76
Sony CDP-338ESD £550	Excellent Good	Only a bit better than the 228 the 338 is a good machine, but not quite good enough for formal recommendation at the price	Custom file, remote, rem vol, hdph, shuffle etc, 2 digital op		76
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 O/S, 18 bit		64
Sony CDP-X7ESD £1300	Good+ Average	A Sony flagship, build and finish is exemplary, styling is unusual but the sound is just average	Custom file, remote, 2 digital op, balanced audio + phonos		76
Sony CDP-R1/DAS-R1 £5000	Very Good Excellent	Sony has aimed high with the R1 and in some ways has created the reference player. Build quality is amazing and it offers a high level of facilities. One or two faults were revealed in both the lab and the listening, but it's generally excellent	Two box, dual optical connection, digital processor, FTS, remote		72
Stax Quattro £2995	Very Good Very Good	Now in mkII guise this substantial player recreated exceptionally strong and convincing bass lines together with a beguilingly musical midband	18-bit DACs, 20-track memory, full IR remote, variable o/p	R	72
Teac PD470LE £279	Average Average	With the LE upgrade the 470 has improved to a just average position	Remote, hdph, 20 track prog		76
Teac ZD880 £450	Good Fair	Decent enough in most respects with a very good build and finish. Its sound isn't competitive enough to inspire any real enthusiasm	Remote, track key access, auto space, comprehensive display, hdph socket etc		70
Technics SLP202 £160	Very Good Average-	A competent budget player; no frills but a good value performance and build quality. Buy the similar SLP227 if you want remote control	Simple facilities, 20 track program, no rem	BB	76
Technics SLP-333 £270	Good+ Average	A decent enough player lacking that final edge necessary for review distinction	Dubbing edit, hdph, digital out, rem vol remote, 20 track prog		76
Technics SLP-555 £320	Very Good Average	A well balanced, well made player delivered at a very fair price. Good facilities for cassette dubbing	Peak level detection, remote, rem vol, hdph digital op	R	76
Technics SLP777 £380	Very Good Average	A higher quality version of the 555, it may impress with its extra facilities. Performance is similar to 555	Display off, full remote, audio level meter, 32 track prog, hdph digital op		76

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-D80K £550	Poor Poor	Congested and harsh sound quality, the cassette deck, amp and loudspeakers being well below par. The built-in timer adds some operational flexibility	Auto-reverse, CD synchro record, remote, timer		77
Aiwa X-D100 £1000	Average- Fair	Very fully equipped with wide ranging in and outputs but poor upgradeability. Sound quality is reasonable on the whole	Digital & optical in/outputs, dual auto reverse, disc file CD etc		77
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
Ferguson HFD28 £300	Poor Poor	Similar to Goodmans 5000 system but with greater power and marginally superior sound	One-piece, semi-remote		77
Goodmans 5500 £320	Poor Poor	It offers the basic features (but no Dolby or magnetic cartridge) and rough and ready sound	One-piece, remote		77
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

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CD MIDI SYSTEMS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
Grundig Studio Line 1 £330	Poor Average+ / Poor	Intriguing package with warm, woolly but attractive sound let down by poor attention to detail and suspect cassette deck. Amplifier appears to be inadequately protected	CD/cassette tuner plus preset equaliser		77
Hinari DK200 Disc Deck £300	Poor— Poor—	Confused user interface is matched to inadequate electronics. Poor – and poor value	Single unit, two cassettes, CD, tuner, remote		77
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
JVC Midi-W91CDM £1111	Good— Average	Very well equipped (viz: multi-disc player, powerful tape related features) with acceptable but rather nondescript sound	Multi-disc player, twin auto-reverse cassette, equaliser		77
Marantz MX493AVCD £549 with LD20 speakers, £449 without	Average Mixed	Good source components (ex cassette) let down by poor amplifier. Flexibility is strong point, and the system may prove attractive where the A/V possibilities can be fully utilised	Twin auto reverse, opt speakers, surround processor etc	R (with LD20)	77
Marantz MX583 £750	Average— Poor	The system has potential in an A/V context, but is patently lacking in a purely audio one. Only the CD excels	Component system with A/V amp, no speakers		65
Marantz MX673CD System £900	Average+ Average	Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess	Various A/V inputs, remote, speakers optional		54
Pioneer S-11 £510	Average— Average—	Fine lower middle market system, with one useful extra – the built in timer. Only the record deck is disappointing	Twin auto reverse cassette, built in timers, one piece amp/cassette		77
Pioneer S-330D £1080	Very Good Very Good	High standard of reproduction on all sources, though mistracking with Dolby C was a limitation. There are few gimmicks and plenty of fine engineering	Dolby C/XX Pro, multi-disc, amp with DAC etc	R	77
Proton AI-3000 £550	Good Good	There are a host of minor problems, including no LW, but the unit is attractively packaged and can be made to sound very good despite a woolly sounding amplifier	One piece CD, cassette, tuner and amp, remote	R	65
Sanyo 39CD £260	Poor Average—	Acceptably compromised basic low end system, offers broadly respectable if unambitious music making for those on a tight budget	One piece + CD, non-remote, manual tuner		77
Sanyo 49CD £300	Poor Average—	Similar to 39CD, but with Dolby B, preset tuning, remote control and more power. Audio wise, it's more of the same, but there's greater stature when loud and cassettes are helped by Dolby B	One piece + CD, partial remote control, digital tuner	R	77
Sanyo 59CD £380	Average— Average—	Adequate performance overall, though endemic lack of pitch integrity takes edge from tape and records. Some inconsistencies in control system too	As 49CD, + full remote, auto source select, separate turntable		77
Sharp CD-X17E £550	Average Average+	Highly specified miniature with detachable speakers. AC mains power only. Good sound let down by crude upper midband and treble. Expensive for what it is	CD luggable with dual cassette & tuner, detachable speakers		77
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 301CD £400	Average— Average	Mainly crisp, articulate sound and excellent ergonomics offset by modest FM results and lack of pitch integrity on cassette	Twin unidirectional cassette, equaliser, 30 preset tuner etc		77
Sony 501CD £500	Average Average	Fair all round performance except noisy FM. Ergonomics and visuals good, but no auto source select, tuner stereo defeat	Twin auto-reverse, 3-band tuner, equaliser etc	R	77
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 Compact 701CD/711CD £700/£800	Average+ Good	Sound quality good all round, though cassette pitch accuracy is below par. Features average but system control is weak	Twin auto-reverse, graphic equaliser (711 only), 30 preset tuner	R (701CD)	77
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 X1 £500	Good Good	Superb value for money from a system with solid straightforward engineering at an attractively low price	Auto-reverse record transport, auto-disc/tape editing, surround sound, remote	BB	77
Technics X5D £800	Very Good Very Good	A mainstream system offering considerable flexibility and power in a traditional suit of clothes, and embodying values that place music first	Twin auto-reverse, tuner/timer, auto record deck, digital amp	R	77
Yamaha AST-C10 £600	Average+ Very Good	Brilliant if flawed luggable with weighty, powerful bass, and a rare combination of expressiveness and clarity unprecedented from such a small package. Good features.	Mains portable twin cassette/CD/radio system detachable speakers, remote	R	77

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
Arcam Alpha £149	Good Average+ +	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB*	50
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

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TUNERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
Kenwood KT-660L £130	Fairly Good Fairly Good	You get your money's worth of gadgets and the radio's basically sound although programming is complicated. AM – fairly good	Timer, clock, all bands	R	65
Kenwood KT-1100D £300	Good + Good +	Behind a gaudy and rather useless display the radio is much better than you might first think. AM – good	Firework display. FM/MW bands only	R	65
Linx Theta £400	Good Very Good	A Magnum Dynalab on the cheap with the hallmark styling of this small British newcomer. Some of the best midrange from any tuner	Manual analogue tuning, no presets, signal strength meter	R	72
Magnum Dynalab FT101 £599	Good Very Good	Although expensive for its fairly minimum set of facilities its excellent sound makes up for what it lacks elsewhere	Analogue manual tuning, no presets, signal strength meter	R	72
Marantz ST35L £125	Good + Average—	It works well enough but the sound could be better for the money	16 presets, AM/FM, digital auto scan, active tracking		55
Meridian 204 £525	Good + Good	Pleasant sounding with a fine finish but does not make the grade at this price	FM only, auto scan, digital, remote, clock timer		55
Musical Fidelity T1 £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
Pioneer F91 £350	Excellent Good + +	Easy to use, this model has excellent RF performance and scored very high ratings on the listening tests	FM/AM 24 presets	R	60
Proton AT-300 £199	Good Good	The AT-300 is pretty on the outside, orthodox on the inside and rather dear. AM – poor	FM/MW only	R	65
Quad FM4 £289	Very Good Good +	Fine sound, excellent ease of use, good build and finish and a more than satisfactory technical performance	7 presets. Digital	R	50
Revox B260 £918	Excellent Very Good	Sophisticated and expensive, the B260 is ideally suited to the rest of the Revox range and should also work well in other systems	FM – virtually everything	R	60
Rotel RT-830AL £110	Good + Good	Fine sounding budget audiophile material, no frills, no fuss	Manual dial analogue, FM, MW, LW	BB	55
Rotel RT-850AL £160	Good + Good +	Scoring well on listening tests and one of the best sounding tuners at its price level, it was a bit let down on AM but RF performance was good	FM/AM, digital	BB	50
SAE T-102 £449	Good + Good +	Expensive for all the radio you get, but sounds interesting. AM – Poor	FM/MW only	R	65
Sony ST-S300L/ ST-S100L £140/£100	Good Good	A reasonable entry point, not for difficult areas. AM – Poor	All bands	R	65
Sony ST 500ES £200	Good + + Average—	Disappointing sound quality but good lab performance. (Includes long wave)	10 AM/FM presets, auto scan digital		55
Sony ST-S 700ES £299	Very Good Very Good	First class in every respect including FM sound quality. Even AM was well above average	FM/AM, 10 presets, digital scan	BB	60
Yamaha TX-L400 £130	Good + + Good +	Good FM sound, let down by poor AM but otherwise good value	16 presets, auto scan, digital, FM, MW, LW	BB	55
Yamaha TX-500 £150	Average + Average	Under a gaudy coat, this sensitive tuner gave reasonable stereo results. However, the AM had again been thrown down a well	20 presets (10 buttons) digital		50

Rating refers to original, tested model

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 Jeklin and Stax models. The majority of these come with some form of transformer which takes the signal initially from the speaker terminals on the amplifier. The actual speaker cables then travel from this unit *via* a

bypass switch to the loudspeakers.

The more down to earth models feature dynamic drivers in circular open-backed designs. The advantage of open backs seems to be a correspondingly open sound and a less claustrophobic feel to the music. One can also of course hear external noises and irritate people on public transport.

The third category are closed-back designs,

which are useful in situations where it is necessary to block out background noise.

Another means of distinguishing different types is the way they sit on your head or ears. There are three styles: circumaural models enclose the ear and rest on the side of the head; supra-aural designs press on the outer ear (pinna); and intra-aural types rest inside the ear and are popular amongst users of personal stereos.

NAME PRICE	COMFORT SOUND	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Aiwa HP-X30 £30	Good Good—	A flashy personal stereo phone which alternatively could be used at home. A slight LF tonal preference slightly colours the response, but it ain't a bad can	Supra-aural, closed-back, dynamic		75
Aiwa HP-V99 £50	Good— Average +	Horn loaded in-ear miniatures with plenty of guts but not enough transparency or bass to compete with the headbanded competition	Intra-aural, closed-back, dynamic		75
Aiwa HP-X80 £50	Good Good	A headphone that's highly suited to non acoustic music and portable sources, nicely made and slickly finished. Sound quality doesn't quite match the price	Supra-aural, closed-back, dynamic		75
Aiwa HPEX-200 £90	Good Good	Modern looking and well finished the Excelias, as they are dubbed, had meaty bass and sounded reasonably open for the type	Circumaural, closed-back, dynamic		63
AKG K135 £35	Poor Fair	Despite a very appealing design the K135s don't live up to the usual AKG standards, though they do have the ability to reproduce rhythm well	Supra-aural, semi-open, dynamic		63
AKG K145/S £58	Good + Good +	Electrostatic tweeters combine with a dynamic mid/bass unit to create very confident sounds in a comfortable headphone. Balance is on the bright side	Supra-aural, semi-open, electrostatic/ dynamic	R	75
AKG K240 Monitor £60	Very Good Good	Something of a classic these AKGs are very user friendly in all respects; sonically on the warm side of neutral	Circumaural, semi-open, dynamic	R	63
AKG K280 Parabolic - £110	Good Very Good	A very revealing and unusual twin driver design that uses the same principle as a satellite dish to beam sound into the ear	Circumaural, open-backed, dynamic	R	63

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HEADPHONES

NAME PRICE	COMFORT SOUND	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
AKG K340 £136	Good Excellent	Heavyweight cans in most respects, the K340 with its electrostatic tweeter is a very revealing headphone. Gives the total electrostatics a good run for their money	Circumaural, closed-back, electrostatic/dynamic	R	75
Audio Technica ATH 909 £55	Average Average	Quite impressive in the treble though a bit bass shy, the 909s worked well at highish levels	Circumaural, semi-open, dynamic		55
Audio Technica ATH 910 £65	Average Good	The closed-back 910s are an improvement on the 909s with a nice rhythmic quality rarely found with headphones	Circumaural, closed-back, dynamic	R	55
Audio Technica ATH-911 £75	Very Good Very Good	Nicely finished dynamic headphones with all the trimmings, plus a very clean and subtle sound	Circumaural, open-backed, dynamic	R	63
Beyer DT 325 £30	Very Good Fair	Lightweight in more ways than one, the 325s may be a little bright for some systems and tastes but will suit duller sources	Supra-aural, open-back, dynamic	R	63
Beyer DT330 Mk II £45	Good Poor	Not the most revealing 'phones encountered, the 330s were nevertheless enjoyable and rarely offended	Circumaural, semi-open, dynamic		55
Beyer DT550 £69	Good Good	On their own the 550s sound articulate with a slightly 'gritty' treble and 'keen' midrange; not suitable for headbangers!	Circumaural, semi-open, dynamic		55
Beyer DT880 £90	Good Good	Well made cans with a warmish sound but fairly solid midrange, though they're not that informative for the price	Circumaural, semi-open, dynamic		63
Beyer DT990 £119	Very Good Very Good	The 990s are definitely a significant pair of dynamic headphones; they have a smooth and yet revealing, neutral sound that is hard to criticise.	Circumaural, open-back, dynamic	R	55
Beyer IRS690 £200	Good + Very Good	High quality infra-red headphones with soft comfy earpads and mellow but informative sound quality which is hard to dislike	Circumaural, open-back, dynamic	R	75
Jecklin Float Model One £79	Good Very Good	Whilst very unusual in appearance the Floats give remarkable sound quality and openness at a reasonable price	Circumaural-ish, open-back, dynamic	BB	55
Jecklin Float Model Two £99	Good Very Good	Helmet shaped and pretty unflattering but open sounding and comfortable in the long term. Note lack of adjustment means you should try before you buy	Circumaural-ish, open-backed, dynamic	R	63
Jecklin Float Electrostatic £399	Good Excellent	One version of the state-of-the-art, these electrostatics have an openness of sound rarely found in the breed, with good dynamic range to boot	Circumaural-ish, open-back, electrostatic	R	55
JVC HA-D990 £65	Good + Good +	Good looking well made cans that offer good sound quality for the money. Sonic nature is of the easy-going, laid-back variety	Supra-aural, closed-back, dynamic	R	75
Koss TD/60 £20	Good Average	Although they're devoid of channel identification and have a decidedly Stateside approach to sound, these are very listenable phones for the price	Supra-aural, closed-back, dynamic		75
Koss K/6X Plus £30	Fair Poor	'Sixties-style' phones from the good ole US of A, their sonic style is unique and can make a system sound quite different	Supra-aural, closed-backed, dynamic		63
Pioneer SE-72 £30	Good + Average—	Neat, nicely made personal stereo oriented phones along the lines of Sony V3s. Sound is on the veiled side, good for aggressive sources	Supra-aural, closed-back, dynamic		75
Quart Phone 30 £40	Good Fair	Whilst not as seductive as their PMB25 predecessor the 30s are reasonably neutral and do improve on some of the competition – though not stunning	Circumaural, semi-open, dynamic		63
Quart PMB 25II £40	Good Good	Despite a somewhat unconventional suspension system the 25s put in a convincing and enjoyable performance with warm yet lively balance	Circumaural, open-back, dynamic	BB	55
Quart Phone 70 £70	Good Good	Competent performers that were hard to criticise but lacked the life and sparkle of which some of the competition are capable	Circumaural, closed-back, dynamic		63
Quart PMB 65 £70	Good Good	Quite revealing and neutral albeit with the usual closed back sound, this competes well with more established models	Circumaural, closed-back, dynamic	R	55
Quart PMB 85 £90	Fair Very Good	These more expensive Quarts bear a striking resemblance to the Jecklin Float models and use two drivers per ear. Sound is a bit bass heavy but not bad overall	Circumaural, open-backed, dynamic		63
Realistic Pro-X £25	Poor Average—	Robust, unanimously uncomfortable and heavily veiled in sonic terms – not a great success	Supra-aural, closed-back, dynamic		75
Ross RE2530 CD £20	Average Average	Rather an 'average' £20 phone that some found uncomfortable due to high pressure on the ears. Sonic balance is on the bright side	Supra-aural, closed-back, dynamic		75
Ross RE2560 CD £25	Good Average +	If you're not too fussy about quality of finish and don't have an elfin head then these British phones warrant attention. Sound could be smoother	Supra-aural, semi-open, dynamic		75
Ross RE-2760 £35	Poor Fair	Stylish white cans from the only British firm in the business. Unfortunately sound quality is not up to par in this price range	Supra-aural, closed-back, dynamic		63
Sennheiser HD30 £13.50	Good Poor	Built specifically for the personal stereo market these small and light Sennheisers have a slightly synthetic sound, but are an upgrade on the average Walkphones	Supra-aural, semi-open back, dynamic		55
Sennheiser HD40 £18	Very Good Good—	Very light and comfortable headphones with an even sonic balance that will suit most sources, but jack is 6.3mm and not suited to personals	Supra-aural, semi-open, dynamic	BB	75
Sennheiser HD450 £27	Good Fair	Modern, simple and lightweight phones that are remarkably robust and which turned in a relaxed if weighty performance that was at worst pleasant	Supra-aural, semi-open, dynamic	R	63
Sennheiser HD480 £37	Good Fair	Using the same shell as the 450s, the 480s were a little softened and unrevealing by comparison with their competitors	Supra-aural, semi-open, dynamic		63
Sennheiser HD420SL £47	Good Good	The 420s gave a full and tangible quality to instruments and voices; whilst not the most revealing headphones around they would suit slightly brash sources	Supra-aural, open-back, dynamic		55
Sennheiser HD520 £60	Good + Good +	A very comfortable and musically capable headphone. If you've got this sort of bread to blow on cans, give 'em a blast	Circumaural, semi-open, dynamic	R	75
Sennheiser HD530 £70	Very Good Good +	One of the better dynamics in its group, the 530s create a sense of space that eludes most sub £100 cans, and they're dead comfy to boot	Circumaural, semi-open, dynamic	R	75
Sennheiser HD540 Ref Gold £160	Good Very Good	The 540 Golds prove that dynamic headphones can be subtle, informative and capable of creating a remarkable sense of space	Circumaural, open-back, dynamic	R	55
Sony A21L £20	Good— Good—	Forward facing in-ear drivers on a folding plastic band provide exceptional clarity for such an inexpensive phone. However, no bass, and fit isn't to everyone's taste.	Intra-aural, semi-open, dynamic	BB	75
Sony MDR V3 £30	Fair Good	Portable stereo oriented phones that are very nicely made and combine clarity with a pleasant lack of distortion	Supra-aural, closed-back, dynamic	BB	63
Sony MDR-V5 £50	Very Good Average +	A nicely made comfortable headphone let down by a limited ability to reproduce music in a natural fashion	Supra-aural, semi-open, dynamic		75
Sony MDR V7 £70	Very Good Very Good	Classy sounding cans that are very slick and work well with all types of music, setting the standard in their price range	Circumaural, closed-back, dynamic	R	63
Sony MDR-CD999 £120	Good + Very Good	A very nice headphone in all respects, the 999s are worthy of the best headphone outputs and high quality sources	Supra-aural, semi-open, dynamic	R	75
Sony MDR-R10 £2500	Excellent Very Good +	Costly state of the art sealed moving coil design built to the highest standards using the finest materials. Sound quality reflects this care, being big, clear, sweet and refined	Circumaural, closed-back, dynamic	R	72

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HEADPHONES

NAME PRICE	COMFORT SOUND	COMMENTS	TYPE	VALUE	BACK ISSUE FULL REVIEW
Stax SR34 £140	Fair Very Good	The least expensive Stax headphones around, the SR34s are lively and rhythmic with good tight bass and a sweet midrange	Supra-aural, open-back, electret		55
Stax SR84 £210	Very Good Very Good	The stepping stone between dynamics and full electrostatics, these electret phones are revealing, open and highly enjoyable	Supra-aural, open-backed, electret	R	63
Stax Gamma pro/SRD-X pro £296/£230	Very Good Excellent	The Gamma pros are like a stethoscope for your hi-fi, revealing subtleties that many loudspeakers fail to resolve	Circumaural, open-backed, electrostatic	R	63
Stax SR Gamma £299 (inc. SRD-6 Adaptor at £100)	Very Good Very Good	The next model down the Stax range from the Lambda, the Gamma is an excellent headphone with little to criticise but the price	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £545 (inc. SRD-7SB Mk 2 Adaptor at £185)	Very Good Very Good	A bit of an industry reference the Pros are frighteningly revealing, bringing across more information than loudspeakers costing twice as much	Circumaural, open-back, electrostatic	R	55
Stax SR Lambda Pro £360/ SRM-1 energiser £635	Very Good Excellent	This combination extracts layers of information that other headphones only hint at. The SRM-1 has more edge than the SRM-T1, but it's good	Circumaural, open-back, electrostatic	R	75
Stax Lambda Signature/SRM-T1 £470/£895	Very Good Excellent	The Signature when combined with the SRM-T1 valve driver must be the most transparent headphone available	Circumaural, open-backed, electrostatic	R	72
Yamaha YHL-006 £30	Average Average	Unusual personal stereo oriented phones that curl up when not in use. Earphones are like golf balls and balance is well suited to Walkmans	Supra-aural, open-back, dynamic		75

PERSONAL STEREO

Whilst not exactly hi-fi components, personal stereos probably play more music to more ears than all manner of domestic systems and as such demand some attention. Now that personal CD players have joined the ubiquitous Walkman in the market, the variety and standard of sound quality is huge, with obscurely named cassette players practically falling out of your cornflakes packet and Discmen going for £300.

Despite their diminutive size personals attempt to incorporate as many gimmicks and features as

possible, cassette players often incorporating tuners, graphic equalisers and Dolby noise reduction. CD players are still relatively expensive and don't tend to vary that much on the features front, rather the amount and quality of accessories differs. Most models come with a mains adaptor and some include remote control.

Sound quality on the cassette front seems to have a proportional relationship to price and integrity of construction – wow and flutter being quite obvious on the cheaper models. CD players

become less noisy as they get dearer and also reduce in size; one drawback of the latter seems to be that immunity to shock suffers as a consequence. Cassette players do, on the whole, seem better suited to the outdoor life than their digital counterparts, as does the software. Bear in mind that the sound and lab ratings given below cannot realistically be compared to those in other categories or between cassette and CD personals

PERSONAL CASSETTES

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa HS-PL300 £110	N/A Average	Good looking, simply laid out player with a sensible selection of features and reasonable sound quality for a small player of this price	Dolby NR, chrome/metal eq, remote		78
Aiwa HS-PX303 £150	N/A Good	Chunky and macho styling combines with comprehensive features and a half decent transport to make a powerful personal	Dolby B & C, chrome/metal eq, remote	R	78
Panasonic RQ-P505 £100	N/A Poor	Very attractive and neat little player with nicely designed controls and XBS bass boost, but sonically it's limited by distinct wow and flutter	Dolby, chrome/metal eq, remote		78
Panasonic RQ-P525 £120	N/A Average+	Fitted with what is effectively a bass only tone control and harbouring all the necessary features the 525 also has a knack with tape replay	Dolby B & C, chrome/metal eq, remote	R	78
Philips D6658 £30	Very Poor Poor	The low price limits sound quality, and this is not a spectacular machine, but it does a reasonable job nonetheless	Graphic EQ, AM/FM		56
Saisho PS90R £40	Poor Poor	A bit of a jumble of features and gadgets, the PS90R has on-board speakers, an extending aerial and even records, but sound quality is dubious	Graphic EQ, types I, II & IV, AM/FM, recorder		56
Sharp JC-270E £130	N/A Average-	Slightly old fashioned design combines with a basic feature count and mediocre sound quality to make an apparently uncompetitive player	Dolby, chrome/metal eq, remote		78
Sony WM-BF65 £90	N/A Average+	Regular size radio/clock/cassette player with a bright even open balance and Sony's forward facing phones. Not as glamorous as slightly more expensive models but sonically not bad	Dolby, chrome/metal eq, radio, alarm clock	R	78
Sony WM-701C £150	N/A Good-	Beautiful little machine with all the necessary buttons'n'switches and a fundamentally exceptional sound quality, marred unfortunately by wow and flutter	Dolby B & C, chrome/metal eq, remote, folding phones		78
Sony Walkman Pro £249-£289	Good+ Very Good	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personals to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line BB in/out, varispeed		52/56
Toshiba KT-4549 £80	N/A Poor	Fully equipped with 10 preset radio and alarm clock the KT-4549 is a bit aggressive on the sonic side and the bass boost system lacks balls	Dolby, chrome/metal eq, radio, alarm clock		78

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 D6800 £130	Average Average-	A competitively priced and reasonably attractive looking player whose sonic performance is somewhat marred by a rather grainy top end	13 x 4 x 17.5cm, 516g, 3" ready, twin hdhp sockets		66
Sanyo CP-12 £260	Fair Good+	Sonically amongst the more enjoyable personal CD players and capable of revealing the musical aspects of a disc in an interesting and entertaining fashion	12.5 x 2 x 12.7cm, 380g, wired remote, mains adaptor	R	66
Sony D-20 £150	Average+ Fair	Not bad for a machine at this price, it's nicely designed and reasonably robust, with reasonable sound quality	13.8 x 3.8 x 15cm, 450g, mains adaptor	R	66
Sony D-88 £300	Average- Fair+	A stylish and 'cultish' object, the D-88 is very small and has an adjustable disc drive for three and five inch discs. Sound quality doesn't quite match appearance	9.4 x 3 x 9.8cm, 300g, 3" ready, mains adaptor, no line out		66
Sony D-150 £300	Fair+ Very Good	One of the most enjoyable machines encountered, sounding informative and sweet and looking very tasty to boot. Comes complete with a tough carrying case	12.6 x 2.1 x 13.5cm, 420g, 3" ready, mains adaptor	R	66

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THE DIRECTORY

CD PORTABLES

CD Portables or Yuppie Blasters as we classified them are basically portable stereos gone digital, ie a compact disc player is included alongside the usual AM/FM radio and single or double cassette deck. Compact disc is a novelty that seems to add a fairly hefty premium onto the price of the standard ghetto blaster, but the improved sound quality over standard cassettes may justify this for some.

In virtually every case a CD output socket is

fitted which means that it's possible to play silver discs through a domestic amplifier and loudspeakers, thus they are some sort of substitute for standalone mains machines (as are the personal CD players). One drawback with having a CD player on board is that batteries are gobbled up even quicker than usual, up to ten batteries being required in some cases. Neither are the units particularly light, the heaviest weighing eight kilos!

However they do all run off the mains too, and come with an appropriate lead for this purpose. Other useful features common to most are spare input sockets to record from an external line source such as a preamplified vinyl disc signal, and microphone sockets for recording live events (although the usual lack of record level adjustment is a nuisance).

MODEL PRICE	SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa CSD-XL25 £150	Poor	It's cheap, cheerful and not too low on features but sound quality from disc is frankly uninspiring	Twin headphone sockets		73
Bose Acoustic Wave £750	Very Good	Not exactly a CD portable as it doesn't play discs, but a highly versatile and stylish radio cassette player that has bass	Input sockets, Dolby NR, PA capable etc	R	73
Grundig RR9000CD £300	Average	Relatively slick machine with full CD function and volume remote control, low on features for price and unspectacular sounding	Remote, motorised volume pot, condenser mic		73
Philips AZ8394 £200	Average—	Stylish in a wasp like fashion, unfortunately the disc playing lets it down somewhat but otherwise it's OK	Twin decks, graphic eq., bass boost, condenser mic		73
Sharp QT-CD43 £280	Average	Quite a 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 tiny in many respects	Clock, twin decks		73

STANDS AND SUPPORTS

It's becoming more and more apparent that all the components in a hi-fi system benefit from being placed on the right kind of support. It is already acknowledged that performance of electro-mechanical transducers, such as turntables and loudspeakers, can be greatly improved by using highly rigid supports. This notion has been expanded to include electronics such as amplifiers and compact disc players, and inevitably a broad range of stands and supports have been produced to cater for this requirement.

With loudspeaker stands there seems to be two

broad schools of design. The most common is the open frame type which uses square section steel tubing (usually less than an inch square) made up to form a tripod or quadropod stand usually fitted with spikes top and bottom to ensure good coupling to both floor and cabinet. However, for reasons of domestic harmony this latter option is often not pursued as eagerly as perhaps it should be. The alternative approach is to use mass. Larger section (approximately 3 inch x 2 inch) tubing is welded between square top and bottom plates and filled with sand and/or lead shot. Again, this type uses

spikes at the base but Blu-tack or the like for coupling with the speaker cabinet.

Equipment supports generally place isolation quite high on the list of priorities and usually use a lightweight steel frame to support an MDF platform. Once again spikes are used to minimise contact with the platform and ensure good coupling to the floor. Minimising weight without compromising rigidity seems to be the aim with turntable supports but those designed for electronics often employ some form of damping to kill vibration, sometimes in the form of mass.

LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
Appolo A820 £40	4 leg Fair	A light open-framed budget design slightly lacking in rigidity and subjectively superceded by other stands costing £10 more.	19 x 19cm 53cm		58
Appolo A10 £47.25	4 leg Fair	A robust and lightweight model, it would make an ideal upgrade for those still happy with the big boxes of old.	19 x 19cm 44cm	R	58
Foundation Fred £65	2 leg Average	With sand filling the Freds made speakers sound tight and coherent with a more even balance.	19 x 19cm 36/43/59cm		58
Foundation Maggi £159	Pair Very Good	Made for Magneplanar and other similar panel speakers they seem to have a healthy effect on the sound quality thereof.	50 x 2cm 2cm	R	58
Foundation Pi £250	2 leg Very Good	Overpriced in material terms the Pi nevertheless has a very positive effect on the low frequency performance of conventional speakers.	20 x 20cm 25/38/46/53cm	R	58
Heybrook Point 5 £50	3 leg Very Good	An unusual triangulated open frame stand that can help certain speakers sound more transparent and fluent — a good value stand	23 x 21.5cm 47cm	BB	58
Heybrook HBS1 £75	4 leg Very Good	With its new aluminium base frame the HBS1 fared very well in the listening tests. It allowed much of the speakers own 'sound' to remain intact.	23 x 21cm 47cm	R	58
Linn Kan II £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 unclouded.	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 IIs nevertheless still need some careful re-examination by Partington.	17.5 x 16.5cm 63cm		58
QED TS22 Tristand £50	3 leg Very Good	Most tracks sounded uplifted or buoyant, never thick nor coloured. It worked well with most of the speakers tried and encouraged a fluid and revealing midband.	19 x 17cm 45/50/58cm	BB	58

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LOUDSPEAKER STANDS

MODEL PRICE	TYPE FINISH	COMMENTS	TOP PLATE SIZE HEIGHT	VALUE	BACK ISSUE FULL REVIEW
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 £55.75	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 £94	3 leg Very Good	Sound quality was basically very good though without the sand in 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 gundrops 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
Deltec 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 £42.75	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 £49.95	Table Very Good	Standing up to the best in most areas, the TT2's only real foible concerns a slight loss of bass 'slam'.	52 x 46.5 x 35.5cm	BB	57
Townshend Suspension Base £145	Platform Fair	Designed to complement the Rock turntable, this platform will bring subjective improvement to a wide range of electronics.	43 x 36cm	R	57

CABLES AND CONNECTIONS

Although cables and connections are sometimes thought to be the least important items in an audio system there has been a growing awareness in recent years that they have a significant effect on sound quality. To this end there is now a vast array of exotic cables and interconnects available to those interested in experimentation. The key observation on cables is that they are much more than mere accessories. Carrying the audio signal, just as any amplifier does, it's really not too surprising that they can influence the quality of that

signal.

The characteristics of any cable are determined by the materials and topologies utilised in its construction. The purity of the conductor, nature of the insulator dielectric, mechanical construction, physical geometry, RF characteristics, efficiency of screening and finally the connectors themselves, all play vital roles in the sonic character. These factors tend to vary more with interconnect cables which are used to carry the signal between active components like pre and power amplifiers. The

interconnects summarised here were tested in 1m terminated lengths and therefore the results and prices relate to that length – some cables may well perform differently when used in longer lengths.

The features column contains information on the material make-up of the different cables with the following abbreviations: OFC – oxygen free copper, OFHC – oxygen free high conductivity (Audionote define the HC as high crystal), PC-OCC – pure copper by ohno continuous casting, LC-OFC – linear crystal oxygen free copper.

INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aparture 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 Livewire Topaz £35	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 £49	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
Audio Technica AT6115 £40	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 Very Good	ANS scored a hit with its transparent midband and revealing but quite unforced treble quality. Bass transients were slightly softened.	Silver signal & Copper screen	R	59
Audionote Silver ANV £140	Poor Very Good	Far weightier-sounding than the flexible ANS, ANV interconnect also possesses a fair degree of treble clarity and sparkle.	21 strand silver Litz		59
Aural Symphonics N/A in UK	Poor Good	This cable enjoyed an open and transparent midband and sounded remarkably neutral and faithful to the source.	OF copper PTFE dielectric	R	59
Budget Patch Cords see text	Fair Poor	As thrown in gratis with cassette decks and the like – frequency extremes were restricted and performances were veiled.	Thin coaxial		59
Budget OFC circa £7	Fair Fair	Subjectively, this cable did lift much of the aural fog experienced with scrawny standard hook-up leads.	OFC		59
Deltec Slink £32	Good Very Good	Ideally used in lengths of under 4 metres, it errs on the lean side of neutral but has an uncommon transparency in the midrange.	4 silver plated OFC strands PTFE dielectric	BB	59
Deltec Black Slink £152	Excellent Excellent	Inherently neutral the cable faithfully reproduced broad and deep stereo soundstages with precise focus and a sense of facility.	8 silver plated OFC strands PTFE dielectric	R	59
Denon LC-OFC N/A separately	Very Good Fair	Supplied with Denon's dearer CD players this cable introduced a peculiar 'twangy' coloration at high frequencies, and a slightly soft bass.	LC-OFC, non-magnetic gold plated plugs		59
DNM Solid-core £15-£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

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INTERCONNECT CABLES

MODEL PRICE (per metre)	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Kimber Kable KC-1 £47	Very Good Fair	Tonally faintly leaner and brighter than the more open-weave PSB, KC-1's treble detail was just too sharp and grainy.	Multi-gauge PTFE dielectric		59
Kimber Kable KC-AG £375	Good Very Good	Treble detail resolution was perceived in a slightly abrupt if wholly controlled fashion. Depth re-creation and lateral separation were excellent.	Multi-gauge silver, PTFE dielectric	R	59
MDM Interconnect £14.95	Good Fair	The subjective performance of MDM did appear a little imprecise at the frequency extremes, but a worthwhile upgrade on budget interconnect.	Coaxial, solid core, gold plated plugs		59
MIT PC-Squared £75	Fair Good	This multi-gauge cable produced a very open and buoyant midband but sounded slightly 'peculiar' at frequency extremes.	OFC, multi-gauge	R	59
MIT Spectral MI330 £193	Poor Fair	MI330 displays a marvellously open and enticing midband quality, bass is warm and rich but this character has a tendency to dominate.	Multi-gauge balanced bandwidth		59
Monitor PC 0100381 £17	Good Fair	There is more than a hint of instrumental muddling and bass is slightly soft, however, the slightly 'shut-in' sound is par for the course at the price	OFC, coaxial	R	59
Monster Interlink 400 £32	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
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
Van den Hul MC-D502 £77	Fair Fair	The tonal balance was 'tilted' by a strong and authoritative bass line, which had the knock-on effect of muting treble detail. A bit dear.	Twin axial silver plated copper, teflon dielectric		59
Van den Hul Thunderline £147	Good Fair	Thunderline essentially parallels the sonic performance of the cheaper D102. HF is occasionally tainted by a 'tizzy' 'coarseness', bass is tight and dry.	Silver plated 'matched copper'		59
Van den Hul MC-Gold £247	Fair Good	It possesses a rich and beguiling treble balance that matches a weighty, slightly warm bass character. Seductive balance may prove worthwhile in some circumstances.	Silver & gold plated copper		59
Van den Hul MC-Silver £747	Good Good	Although remarkably transparent for an asymmetric design this costly cable was not considered to be of 'state-of-the-art' standard, and is bettered by cheaper models.	19 silver plated copper strands		59
Vecteur 8045 £49	Very Good Good	Sounding solid and forthright it might seem slightly cold in some systems but the treble 'edge' is mercifully clean. Very low frequencies were a little lacking in 'slam'.	LC-OFC signal & screen	R	59

LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Absolute Wire Force 4 £4.50 per metre	Good Fair+	By current standards there was a loss of fine, sharp detail at the frequency extremes, but it has a big and friendly sound	744 OFC strands, PVC dielectric		64
Audionote OR-200 £16 per metre	Fair+ Fair+	Open and detailed throughout the midband but a grainy coloration tended to corrupt subtle timbral information at very high frequencies	200 LC strands, polyurethane and cotton dielectric		64
Audionote AN-SP £100 per metre	Average— Very Good	A clean and open sounding cable that offered a deep and pleasantly detailed perspective. Bass was slightly restricted, but seemed tight and coherent nonetheless	15 silver strands, polyethylene dielectric		64
Audioquest Livewire Black £15 per metre	Good Good	It proved clear and punchy but with some grain across the treble. Nevertheless Black remains an interesting concept and proved better than Livewire Green	OFHC, surface only – foam core construction	R	64
Audio Technica AT6120 £10 per metre	Fair+ Fair	Compared to earlier LC-OFC cables this PC-OCC derivative sounded smoother and less aggressive	PC-OCC, PVC dielectric		64
Bellwire 12p per metre	Poor Average—	Broadly speaking it delivered a bright and tizzy sounding treble with a fairly open and detailed mid with little or no bass resolution	0.5mm single strand, PVC dielectric		64
Deltec 8S £144 – 5m pair	Good Good+	The unerring transparency and detail resolution of 8S throughout the midband makes it a far cleaner and more spacious sounding cable than others at the price	4 silver plated OF copper strands, PTFE	R	64
Deltec Black Sixteen £456 – 4.5m pair	Very Good Excellent	Bass was deep and rhythmically secure, the mid tonally pure and free of additional sibilance while the treble was both relaxed, sweet and highly detailed	16 silver plated OF copper strands, PTFE dielectric	R	64
DNM Solid core £2.30 per metre	Average Fair	A good general-purpose solid-core, though too bandwidth limited for high-end applications. Sounds great in some systems	0.65mm single strand, webbed PVC dielectric	R	64
Exposure £2 per metre	Good Good	It could sound a trifle matter of fact but this emotive flattening was also somewhat dependent on the music program. It is also highly suited to long runs	56 OFC strands, webbed PVC dielectric	R	64
Kimber Kable 4PR £49.45 – 5m pair	Fair Fair+	This directionally marked cable benefitted from an open and airy treble quality but seemed notably leaner than 4TC. Bass was well round and satisfyingly taut	4 x 7 copper strands per conductor, PVC dielectric		64
Kimber Kable 4TC £16 per metre	Good Good+	4TC made a great impression in the listening tests with an open midband, a smooth and unfatiguing treble with slightly rich but suitably weighty bass	OF copper, PTFE dielectric	R	64
Linn K20 £2.20 per metre	Good Fair	Subjectively it erred on the forward and bright side of neutral but enjoyed an essentially clear and punchy delivery	56 OFC strands, webbed PVC dielectric		64
Marantz ML-55S £30 – 10m	Fair Fair	Subjectively this cable offered a loose and splashy treble which, though not overtly bright, did compromise both tonal and timbral accuracy	30 OFC strands, 3 conductors PVC dielectric		64
Mission Cyrus £2.50 per metre	Average+ Good	Because of its impedance characteristic this cable will deliver a smooth and unfatiguing treble balance with loudspeakers offering an easy load	0.8mm single strand, PVC dielectric	BB	64
Monitor PC Silverline PC4 £5.75 per metre	Good Average	Sonically it laboured under a heavy and claustrophobic balance, lacking the see through transparency and lucidity of the better solid core cables	2072 x 0.07mm silver plated copper strands		64

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LOUDSPEAKER CABLES

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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
Musical Fidelity Lifeline £11.50 per metre	Fair Good-	Lifeline did demonstrate a strong directional inclination, affording a laid back but fairly neutral balance when correctly oriented	4 x 0.8mm PC-OCC strands	R	64
Naim NAC-A4 £2.25 per metre	Good Fair+	Tinged with brightness while the deep bass response seemed both over heavy and poorly integrated compared to the immediate competition	Multistrand, webbed PVC dielectric		64
NVA £6 per metre	Average + Good	A light and breezy sounding cable best suited to short lengths, NVA benefitted from a clear and transparent outlook	7 x 0.25mm silver alloy strands, PTFE	R	64
Origin Live Soli-Core Ordinary £1.80 per metre	Good Fair+	Subjectively it bettered the performance of the costlier Super version, affording a pleasantly unshielded type. Overall presentation was mildly restricted and cloaked in a faint aural fog	1.8mm and 0.5mm single strands	R	64
QED 79-Strand 90p per metre	Good Fair	For much of the last decade QED 79-Strand has been the first port of call for enthusiasts on the upgrading ladder, a tradition that should still hold true today	79 strand, PVC dielectric	R	64
QED Incon Graphite £1.75 per metre	Fair + Fair +	This graphite version of Incon sounded cruder and generally more heavy handed than the cheaper unshielded type. Overall presentation was mildly restricted and cloaked in a faint aural fog	OFHC, polymeric screen		64
QED Flat 200 £1.95 per metre	Good Good	I detected a degree of confusion at low frequencies but this did not stifle the acoustic atmosphere which remained open and positive	200 strands, flat webbed PVC dielectric	R	64
Rotel Supra 4 £2.49 per metre	Good + Good	Ideal for both long and short runs, it furnishes a big sound that benefits further from a smooth, unfatiguing treble	1,036 OFC strands, webbed PVC dielectric	R	64
Rotel Supra 10 £6.49 per metre	Good + Good	Supra 10 provided a very free and open sound that was unhindered by any excess at low frequencies. Worth its weight in scrap copper!	2,562 OFC strands, webbed PVC dielectric	R	64
Sony RK-S5ES £59.95 - 5m	Fair + Fair +	The sound of this cable was also somewhat controlled and over damped. The treble was relatively free and airy but lower octaves, including the midband, were constrained	350 x 0.08mm OFC strands, heat shrink dielectric		64
Solid core mains cable 36p per metre	Fair + Good	It enjoys much of the smooth treble and articulate midrange usually associated with the better solid core derivatives. Lean but taut and rhythmically coherent	1.5mm square, 3 cores, PVC dielectric	BB	64
Sterling £99 per metre	Fair Fair	This pre-production sample possessed a strangely muddled and reserved sound quality. It suffered from a progressive instrument modulation	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-OFCC PTFE insulated strands	BB	64
Vecteur S-CV90 £40 per metre	Fair + Fair +	It seemed both less transparent and integrated throughout the midband than R-CV30, though both frequency extremes were spruced up with a tighter sharper delivery	6 x 0.7mm LC-OFCC strands		64

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THE DIRECTORY

IN-CAR ENTERTAINMENT

In-car entertainment is an area not usually associated with the esoteric world of domestic hi-fi. However, it represents a source of musical entertainment that many of us are exposed to every day. The majority of new cars are fitted with some form of radio before they leave the showroom and in many cases this usually very basic player is taken for granted and accepted as representative of in-car audio standards.

For the price of a budget amplifier or more, there is a wide variety of in-car machines to choose from,

including cassette, CD and even DAT players. The majority of sub £300 players are integrated units featuring a cassette player, AM/FM tuner and amplifier, all in one remarkably compact standard sized box. At this price level the cassette players tend to be fairly basic affairs, although autoreverse and noise reduction systems are both fairly common. Tuners are usually of the digital variety with varying degrees of sophistication in signal tuning and presetting, with some machines featuring as many as 18 FM presets. The emphasis is on the frequency

modulated band and AM often suffers as a consequence, but fortunately for radio enthusiasts there are some exceptions.

The amplifier is usually designed to drive two pairs of speakers mounted fore and aft of the vehicle, and a fader is fitted to adjust the balance between the two. The dearer machines feature separate bass and treble controls which can be quite handy given the unusual acoustic of the car environment and the variety in balance and presentation to be had from car speakers.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Alpine 7282L £250	Good Very Good	A very attractive and seductive sounding player. The matt surfaced transparent preset keys are especially sexy	Bass/treble controls, 12 FM 6 AM presets, chrome eq., clock, 8W	R	61
Alpine 7905M/3539 £650/£350	Excellent Excellent	An easy to use and attractive CD/tuner, partnered with a powerful and flexible amplifier to give an effortless source of in-car entertainment	Bass/treble controls, 12 FM, 12 AM presets, slide-out, 150W	R	68
Blaupunkt Windsor SQR 38 £275	Good Average	Not very enthralling sonically, the Windsor is rather low powered but does have a reasonably stable tape transport	5 FM, 10 AM presets, 3.1W		62
Clarion 916HP £160	Good Average	With its rubbery buttons and touches of white this is a modest looking player let down by a weak cassette	Bass/treble controls, 5 FM, 5 AM presets, 9W		61
Clarion 946HP £250	Very Good Very Good	A good FM side let down slightly by AM performance. This Clarion is particularly nice to use with its nifty SAM tuning system	Bass/treble controls, 12 FM/6 AM presets, Slot-in, 15.1W	R	61
Clarion CDC7000/10028HA £650/£250	Very Good Excellent	Despite a slightly off-beat cartridge system the Clarion combo put in a performance that had the sonic edge over other CD/tuners in its test group	Bass/treble controls, 12 FM, 12 AM presets, security code, 80W	R	68
Goodmans GCE229 £150	Fair Average	If knobs, switches and legends are your bag then the GCE229 is the one for you - a lot of gizmos for the price and it even sounds OK	Bass/treble controls, 6 FM/6 AM presets, Chrome eq., clock, MSS, 10.1W	BB	61
Hitachi CSK-402E £250	Good Good	An attractively designed little player that for once doesn't disappoint when it comes to playing music, and it even has a security system	Bass/treble controls, 6 FM, 12 AM presets, Dolby, chrome eq., music search, 7.4W	R	62
Nakamichi TD-400E/PA-300 II £495/£329	Very Good Very Good	If you want your in-car entertainment to compete on sound quality grounds with your domestic system, this combo offers a very strong challenge	Bass/treble controls, 5 FM, 10 AM presets, uni-directional, chrome eq., Dolby B, C, 75W	R	62
Nakamichi TD-700E/PA-300II £874/£329	Very Good Excellent	For those who appreciate the wonders of analogue there are few in-car players to really compete with this superb cassette/radio. You can even adjust azimuth	Bass/treble controls, 6 FM, 6 AM presets, music search, Dolby, 75W	R	68
Panasonic CQ-497 £117	Fair Poor	The CQ-497 has a traditional style analogue tuning system making it easy to use. AM reception was good but the other sources are less encouraging	Bass/treble controls, chrome, NR, 7W		62
Philips DC680 £180	Average Good	A colourful and musically competent player that despite a gammy volume knob is well worth checking out.	8 FM, 4 AM presets 3.5W	R	61
Pioneer DEX-M300/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

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

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THE DIRECTORY

VIDEO RECORDERS

For some time there's been a move to improve both the video and the audio quality of video recorders and TV sets alike as a necessary prelude to a proper integration between the two. Hi-fi video is obviously an important element in the story, and so is Dolby Stereo, the ambient 'surround sound'

system. The weak link of course is on the broadcast side. Although TV sound is well up to normal hi-fi standards, it has always been in mono and unjustly or otherwise has rarely attracted much audiophile interest. But TV sound is – or shortly will be – freed of the shackles of mono by the introduction of NICAM

stereo. NICAM – an acronym for Near Instantaneous Companding and Modulating – is the missing link that will help facilitate the much feted integration of video with audio. And then we have S-VHS, a system which does for picture quality what the other developments promise to do for the sound...

NAME PRICE	LAB SOUND & PICTURE	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai VS-75EK £550	Average Good	Excellent performance and a slick set of controls make this recorder a pleasure to use. Good price is a bonus	Hi-fi, NICAM, programmable remote	BB	71
Akai VS-77EK £700	Average Good	Another fine and carefully designed model from the impressive Akai video stable. The Dolby installation, whilst flawed, is certain to increase interest in the system	Hi-fi, NICAM, Dolby Surround decoder & stereo amp	R	71
Ferguson FV33H £500	Very Good Below Average	Beer budget NICAM has excellent tape search facilities and an intelligent remote control. Neither picture nor sound quality however are state of the art, and ergonomics are poor	Hi-fi, NICAM, transmitter LCD remote control		71
JVC HR-D750EK £500	Good Average+	Well sorted and relatively affordable NICAM recorder with LP sound only. It is pleasing to use and helpfully equipped, especially when trying to find individual recordings buried in long tapes. Performance is good in relation to price	Hi-fi, NICAM, transmitter LCD remote control	BB	71
JVC HR-S5000EK £1000	Good Very Good	This is the first domestic S-VHS recorder on the market, and it's an unusually well designed one with a wide range of well sorted features and controls. Sound and picture quality are close to state of the art, and miles ahead of any non-S-VHS recorder	S-VHS, Hi-fi, NICAM, LCD remote	R	71
Mitsubishi HS-B70 £1000	Very Good Very Good+	Superb model, and true state of the art picture quality, though you'll need a high grade S-VHS compatible monitor to reap full advantage. The facilities are also wide ranging and generally helpful	S-VHS, Hi-fi, NICAM, LP & SP, programmable remote	R	71
Nordmende V4405K £799	Good Good	Fine basic sound and picture quality, but the RF convertor introduced significant losses. An excellent model, but configured for German home market. VPS compatibility is of no practical use here, and the recorder lacks NICAM	Hi-fi, transmitter handset, digital FX		71
Panasonic NV-FS1 £1000	Poor Good	The control system is poorly organised, with cramped legends and some strange machine logic. Bar code programming is hardly a great achievement either. Picture and sound quality are good, but not state of the art	S-VHS, Hi-fi, NICAM, bar code programming		71
Sanyo VHR-D4710E £900	Very Good Good	Fine colour and moderate detail make for a basically good video section to match a fine sound section. Some of the facilities are a little disappointing however and the deck looks expensive	Hi-fi, NICAM, infra-red headphone remote, digital FX		71

COLOUR TELEVISIONS

The standalone television set is rapidly evolving into a key component in integrated home entertainment systems. NICAM digital stereo sound is now being broadcast for several hours a week from London and Yorkshire transmitters, so stereo CTVs are now becoming available equipped with NICAM decoding and with rather more attention paid to the built-in amplifier and speakers
NICAM is also available on Hi-fi stereo

videorecorders (see above), and this is usually the more practical route for hi-fi system integration, as well as allowing favourite musical events to be saved on tape. To both watch and record with stereo sound will require NICAM on each of course, but the decision to update one or the other first will probably have as much to do with the age of the respective components than the convenience of the interconnections.

The ten CTVs tested so far are all luxury stereo models with 'flatter squarer' 59cms tubes of various kinds. Best suited to a viewing distance of about 7ft, these are one size up from the most popular 51cms size sets and take about 23 per cent of the top 30 per cent of the market. All have remote control, Fastext (enhanced teletext), and many have on-screen graphics and flexible in/out socketry.

NAME PRICE	SOUND PICTURE	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ferguson 59K5Q £599	Average— Good	Attractive and compact design highlights unusual (and rather nice) matt finish Super Planar tube. Picture and ergonomics are pretty good but on-board audio is a bit of an afterthought, lacking sufficient welly for music programming; socketry adequate	59cm SP FST, NICAM, Fastext, o/s graphics	R	76
Grundig ST-63-460TT £649	Average— Average+	Bulky set's shape resembles a square-rigged sail; screen tilts back slightly, so might suit floor mounting, though beware room reflections. Picture quality is good, if a touch bland, but ergonomics are fairly impenetrable – no on-screen graphics either. Halfway respectable sound quality is over-enriched by cabinet drone.	59cm FST, NICAM, Fastext		76
Hitachi C25-P759 £699	Average— Average—	Visually very compact and neat, with excellent handset ergonomics and good on-screen graphics and features. Picture quality 'hyped' and compromised by 'peaked' luma response; on-board sound has muscle but not subtlety, and NICAM (SCART) output lacks muting.	59cm FST, NICAM, Fastext, o/s graphics		76
ITT Nokia £629	Average+ Average—	Bulky square-rigged shape helps deliver a respectable standalone sound quality at a modest enough price. A versatile set with good handset but no on-screen graphics, the picture quality of our sample lacked fine detail resolution, lending a 'soft focus' effect	59cm FST, NICAM, Fastext		76
JVC AVS250 £550	Average+ Average—	This compact and delightfully versatile non-NICAM set has respectable on-board stereo sound and lovely screen graphics, along with an infernal handset. Our sample suffered a tuner problem which marred a picture quality which was pretty good when monitoring baseband signals off tape.	59cm FST, Fastext, o/s graphics		76
Mitsubishi CT-2553 STX £649	Average Good	Arguably the best all-rounder in the group, this compact monitor-style set suffers from exasperating ergonomics but the picture is detailed if a shade untidy, the sound lusty if crude. NICAM (SCART) output lacks muting, and colour rendition a shade individual	59cm FST, NICAM, Fastext, o/s graphics	R	76
Panasonic Prism TK-24 W1 £699	Average+ Average—	Handsome but bulky set delivers serious standalone sound quality. Lovely ergonomics but off-air picture quality marred by tuner section noise on our sample (works fine as picture monitor). Good NICAM (SCART) output.	59cm FST, NICAM, Fastext, o/s graphics		76
Philips 5574 £599	Average Average+	Neat and compact for a front-speaker set, this competitively priced allrounder lacks on screen graphics and remote white level (contrast) but is otherwise well equipped, if a shade undistinguished and conservative	59cm FST, NICAM, Fastext	R	76
Sanyo CBP2559 £579	Poor Good+	Lovely subtle and detailed picture quality totally justifies strong recommendation, though handset is obtuse (lacking white level) and on-board sound is dire. NICAM £50 update due early 1990	59cm FST, Fastext, o/s graphics, picture-in-picture	R	76
Sony D2512U £699	Average+ Average	Beautifully styled around the unique Trinitron tube, the sound benefits substantially from the odd looking detachable loudspeakers. Nice ergonomics with good on-screen graphics, the otherwise detailed picture is a little 'hyped'.	59cm Trinitron, NICAM, Fastext, o/s graphics	R	76

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PERSONAL MESSAGES

Paul Messenger dabbles with some CD black magic, and dips further into the Aro/Ekos equation.

Three months back I encountered an extraordinary 'home brewed' CD player, which caused me to readjust my expectations of the CD medium. I haven't admitted actually liking CD yet, but have certainly started feeling a lot more positive towards what looks increasingly like an irresistible marketing force. But just as important as feeling more positive about a format we look like being lumbered with, is the realisation that we still know remarkably little about CD, and that there's still lots of potential for improving performance.

There's a certain *deja vu* in recalling that the vinyl LP was already 20 years old when Linn, Rega and rivals came on the scene and changed everybody's perceptions of turntables and expectations of vinyl, generating the dynamo that has driven specialist UK hi-fi manufacturing for most of the past decade. Since compact disc is only seven years old, it's still getting its act together, and in the process will continue to throw up all sorts of surprises.

Few will be much more bizarre than this month's 'tweak', which sets you chuckling when you hear what it involves, and then wipes the smile off your face when you hear that it works. I can't claim any originality in this. The discovery may have well originated with some people who call themselves Quicksilver Hi-Fi or some such, and who operate from Georgia, in the deep south of the US of A. The news travelled to Las Vegas, where one Dave Marchant of Mission couldn't believe his ears.

A day or two after his return, DM visited me with some extra electronics in a (rather successful) attempt to stop the giant 767s sounding spitty (see review). That done he played a CD, removed it from the player and went behind a curtain to perform some cabbalistic ritual to which we were not party. Replaced in the player and played again, the soundstage seemed distinctly better defined and focused, and the whole performance seemed somehow tauter and sharper.

It wasn't an enormous difference, but was definitely an improvement, probably greater than that obtained by switching off the display on the Mission *PCM II* CD player, though less than often found when changing absolute phase.

The chuckle comes in the denouement that the modification consists of scribing a line around the inside and outside edges of the disc, using a felt tip marker pen with water soluble black ink (which should ensure none leaches into the polycarbonate of the disc, though I'm not offering any guarantees). Confine the ink to the periphery and don't get it all over the surfaces, or you'll just end up with a mess.

I'm not even going to promise you an improvement, though anyone who enjoys tinkering really ought to give it a go. It certainly works with a good quality Philips-based machine like the Mission, but other makes use different error correction processes, which may have some bearing on the matter.

The only theory I've heard to explain this phenomenon is that the black pigment helps absorb some of the past-scanning laser light, some which otherwise bounces around being internally reflected within the disc. This absorption may make the task of error correction easier, and so assist the sound quality.

Given that the laser light is concentrated at the red end of the spectrum, it might be worthwhile experimenting with different colour pens, though I'm afraid my patience doesn't stretch that far. It also raises questions over all the shiny reflective machined surfaces that are often used around the laser mechanisms of CD players, and whether these should be blacked out too. Food for thought.

As is some of the feedback I have been receiving regarding the original piece on CD modifications. But I've got a bit more checking to do before encouraging anyone to start dismantling their latest high tech toy. In the meantime, it's back to analogue for a bit.

What with all the loudspeaker

reviewing I've been doing recently, and the attendant frequent blind listening panel tests, quite a lot of hi-fi industry people find their way down to this seaside backwater. Many seem intrigued to notice that I use the Naim *ARO* tonearm on my Linn (which is far from standard), and invariably ask me how it compares to Linn's own *Ekos*.

Until now I've had to reply that I didn't know. My own *ARO* actually pre-dates the *Ekos*' launch, so was not an alternative at the time. I did borrow an *Ekos*-equipped NVA turntable for a few weeks back last summer, but the different turntable and cartridge on that occasion made any sensible tonearm comparison impossible.

There's still a measure of uncertainty due to the differences between the standard and my Naim-modified *LP12*, but the chance to borrow a current *Sondek* complete with *Ekos* and *Troika* was too good to miss. The other variable is that my own turntable sits on an Origin Live *Skyline* table, the visitor on a Sound Org.

Given the component commonality, I was mildly amazed at how different the two sounded. Even without the extra bandwidth and resolution of my active *Isobariks*, the distinctions were very obvious, and would seem to provide some clue to the different directions in which these once closely allied companies are moving.

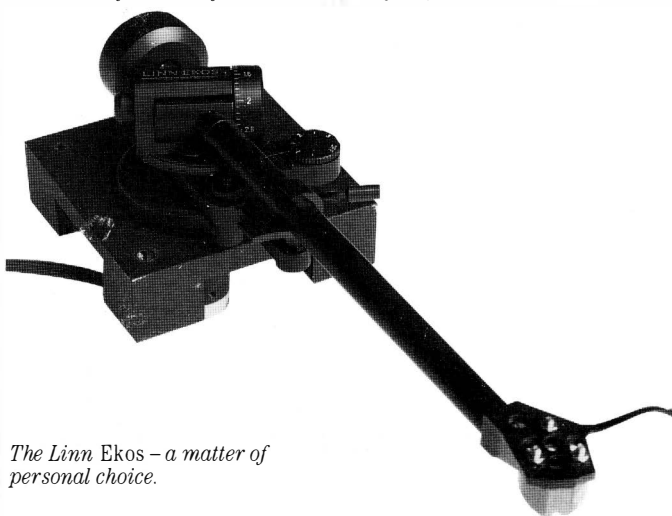
Going from Naim to Linn one is immediately struck by the extra

high frequency output and detail that the rigid-bearing Linn arm recovers and conveys. However, although the treble resolution was increased, the dynamic freedom and range at low frequencies seemed just as significantly impaired to my ears.

To put it another way, the Linn sounds a bit tight and congested in the bass frequencies, but makes up for this with extra detail and sparkle at high frequencies, with wider and more precise imaging, whereas the Naim sounds comparatively dull, yet somehow keeps better faith with the flow and rhythm.

I don't think it's really possible to say that one is better than the other – or, for that matter, necessarily better than half a dozen other top tonearms around at the moment. The *ARO* remains my personal choice, but the other day a visiting designer/manufacturer found the comparison equally fascinating and plumped just as happily for the *Ekos*. And a dealer friend of many years standing, who often hears things much the same way that I do, and who has gone to greater lengths than I to control the variables, is also a confirmed *Ekos* fan.

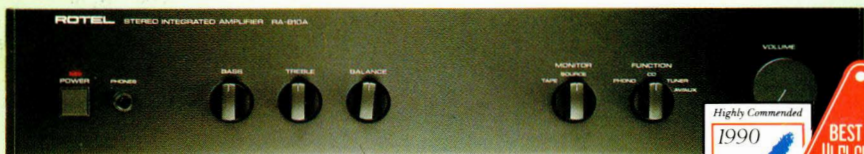
It's not a decision that one individual should try and make on another's behalf. The fact that I choose to drink Kenyan coffee where others prefer Costa Rican or Javanese beans is entirely relevant – as is the observation that the midi-system owning majority settles for instant.



The Linn Ekos – a matter of personal choice.



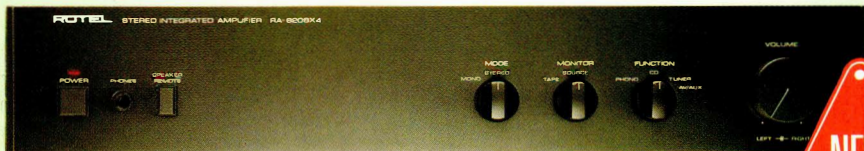
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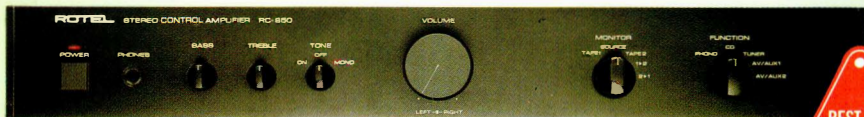
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