

HI-FI CHOICE

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

89 LOUDSPEAKERS
-- SUMMARISED

109 AMPLIFIERS AND
32 TUNERS -- SUMMARISED

53 CD PLAYERS
-- SUMMARISED

GO FOR GOLD! A £3,000
TURNTABLE MUST BE WON!

20 PERSONAL STEREO
UNDER REVIEW

109 CARTRIDGES
-- SUMMARISED

35 CD MIDI SYSTEMS
-- SUMMARISED

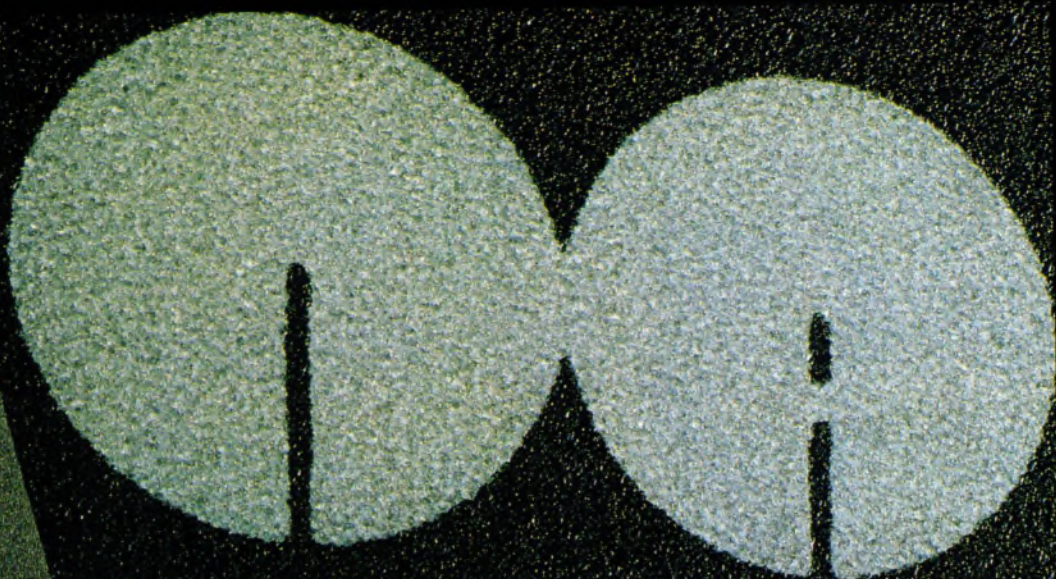
59 CASSETTE TAPES
REVIEWED

43 CASSETTE DECKS
-- SUMMARISED

46 TURNTABLES AND
26 TONEARMS -- SUMMARISED

OVER 40 AMPLIFIERS REVIEWED

TEST SUMMARIES ON OVER 550 HI-FI PRODUCTS -- FROM OUR OWN INDEPENDENT LABS



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HI-FI CHOICE

ISSUE NUMBER 56: MARCH 1988



Front Cover: The Recommended Luca Tech Claymore. see page 53

18

READERS WRITE/CHOICE ANSWERS

Your views, ideas and queries on all matters audio along with our answers and suggestions.

20

ASPIRATIONS: FILLING IN THE COLOUR WITH SOUND



This month's foray into stylish homes with stylish hi-fi takes us to a high tech flat in Epping Forest, appropriately kitted out with Meridian hardware.

26

GO FOR GOLD!



Your chance to win one of Scotland's most prestigious turntables the £3,000 gold-plated Source/Odyssey plus the £249 Audio Technica OC-7 cartridge.

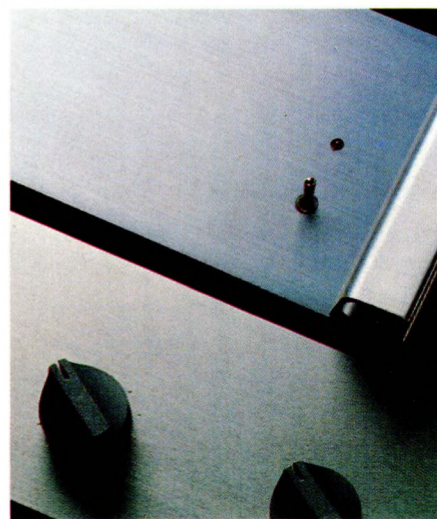
28

PERSPECTIVES: THE BOWERS LEGACY



Paul Messenger visits B&W to assess the technical legacy of one of the UK hi-fi industry's most important catalysts.

AMPLIFIERS



33

MARKET RESPONSE

The results of Dan Houston's dealer survey, including sales, reliability and the dealers' viewpoints on amplifiers.

37

CHOOSING AND USING

A practical guide to amplifier selection; written non-technically for music lovers not engineers.

7

UPDATE

Keeping you up to date on the latest products, business and technical developments in the industry.

15

AND THE SHOW GOES ON . . .

Las Vegas' Winter CES is now established as the second most influential hi-fi show of the year (after Summer in Chicago). Paul Miller sifts through kilos of excess literature.

39

AMPLIFIER REVIEWS
Martin Colloms and Chris Bryant put over 40 amplifiers through their tests.

87

TECH TALK
The background to the amplifier tests.

88

CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS
The outcome of our latest amplifier tests, plus some favourites from earlier reviews.

60

BACK ISSUES
We cannot guarantee old birthday issues – but *Choice's* chronicling of the hey-days of hi-fi makes interesting reading.

TAPES

91

CHOOSING AND USING TAPES
How to find the right tape for your machine, plus the test procedures.

93

CASSETTE TAPE REVIEWS
Alvin Gold reports on 52 cassette tapes. (Not the 59 promised on the cover! Sorry.)

109

CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS
Alvin's favourites from this tape review.

PERSONAL STEREO

113

CHOOSING AND USING PERSONAL STEREO
Where to start and what to look for.

115

PERSONAL STEREO REVIEWS
Jason Kennedy brings you the lowdown on 20 personal stereos with graphs 'n'all.

129

CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS
The personal stereos which are worth tracking down.

130

SELECTED DEALER DIRECTORY
Where to go for the best hi-fi and service in your area.

134

SYSTEM BUILDING
What to look for and how to allocate your budget when putting together a system.

137

THE CHOICE DIRECTORY
Our unique information-packed buyers' guide to all the hi-fi products we have reviewed which are currently available.

162

GLOSSARY
Technical terminology made simple.

MENU

Nearly a year since *Choice* last examined amplifiers, the thirty or so vacancies for new entries was somewhat over subscribed. We've managed to cover a pretty wide range though, leaving some of those not available in time (notably Mission's revamped Cyrus', plus new Onkyo, Proton and Mordaunt-Short models) until our next visit.

Last year's group was dominated by the simple enthusiast oriented budget amplifiers selling for £120-£160 – models which paved the way in terms of improved sound quality from Far Eastern manufacturers. Many of those amplifiers remain unchanged, but above them a new group of similarly improved mid-price models is appearing, with significantly greater credibility than their predecessors.

This new group of amplifiers was again tested by Martin Colloms, preserving continuity with previous projects, but on this occasion Chris Bryant has acted as assistant and co-author, instead of Paul Crook and yrs trly.

We have taken a lot of care over integrating the latest listening test results with earlier subjective findings, but it's worth pointing out that such value judgements can never be absolute. A single overall ranking is inevitably a gross oversimplification, and our advice is always to track down a demonstration of differences that vary in importance from one system or from one individual to another.

Our other comparative reviews this month cover the latest formulations on the blank tapes, to keep you up to date with the latest versions of these constantly evolving products, and provide the necessary matching data for next month's big cassette deck project. Inspired by the success of the Sony *ProWalkman* in AG's last cassette deck book, we sent Jason Kennedy off with a batch of other upmarket personals, plus a few downmarket ones besides, in the hopes of finding some worthwhile alternatives. So now you know (see pp 115) ...

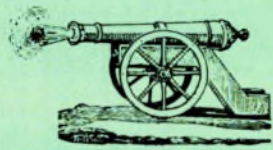
Paul Messenger.

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Enquiries regarding the content of this book should be made in writing to *Hi-Fi Choice* Editorial, 14 Rathbone Place, London W1P 1DE. We regret enquiries cannot be dealt with by telephone. While every care has been taken in the preparation of this book, the publishers cannot be held responsible for the accuracy of the information herein, or any consequence arising from them. Readers should note that all judgements have been made in the context of equipment available to *Hi-Fi Choice* at the time of review, and that 'value for money' comments are based on UK prices at the time of review, which are subject to fluctuation and are only applicable to the UK market. This edition © 1988. Felden productions



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Technics

Technics

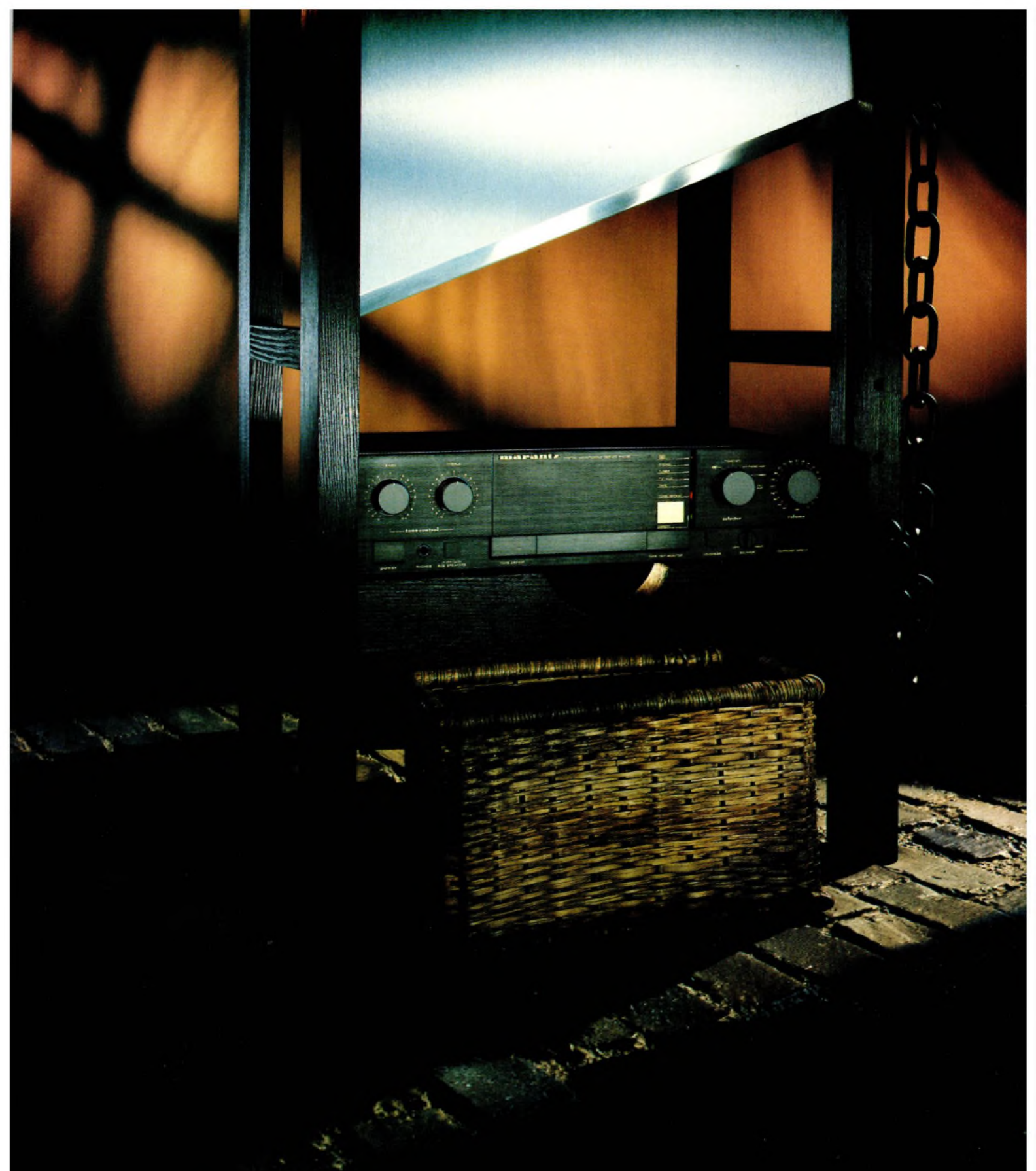
Technics

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SL-P1000 model shown features full remote control with digital volume control, 20 selection random access memory, music scan, 2 speed search dial cuing, auto pause, auto space, vibration-isolated optical deck, Class AA output stages, twin D/A converters, gold plated output terminals and multi-function fluorescent display.

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BUSINESS TRADE

MERIDIAN MERIT

Boothroyd Stuart, maker of the prestigious Meridian equipment, has won a British 1988 Design Award.

The firm's *200 Series* compact disc playing system (partly featured in this month's *Aspirations*) attracted the Council's eye for its aesthetic and engineering excellence. The winners were announced last month but BS director Allen Boothroyd said he would be presented with his certificate by the Duke of Edinburgh in Glasgow on April 13. Boothroyd Stuart also won the award in 1982 for their *100 series* amplifier and the same team won the award on behalf of Lecson Audio in 1974.

Allen Boothroyd said he was delighted at the prospect of winning again, pointing out that 1987 had been an award-winning year. BS were selected for the Component of the Year Award 1987 by Stereo Sound Magazine in Japan, for their *207 CD* player and won the Japanese 17th Component Grand Prix for their *200 Series* (which was only launched last October). BS export nearly 20% of their products to Japan.

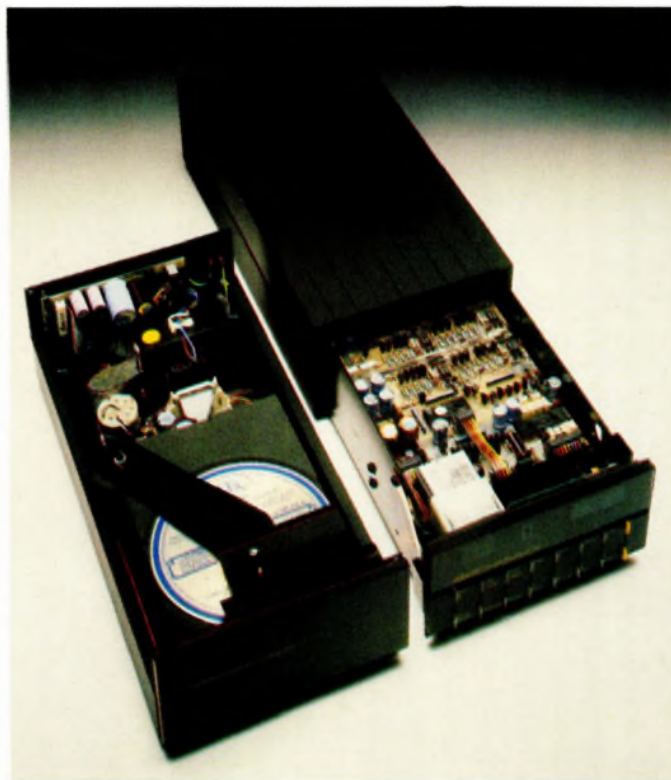
The Design Council confirmed that the BS duo were the only team to win the award three times in one industry.

ALTERNATING SCIENCES

Mister van den Hul is looking for a permanent trader to deal with his exotic products in this country.

The Dutch cables and cartridges man has ceased using Automation Sciences (now under administration) "for financial reasons", and is temporarily importing *via* Viper Ltd - run by the ubiquitous freelance Bob Lawson, and partner Ian Bolt. Mr van den Hul said that about eight companies had approached him for the contract and that he was considering splitting his operation so that one firm would deal with cartridges and another cables; this is the vdH situation in America. A decision would be made in March he affirmed.

Meanwhile Viper have



Award winning design from Boothroyd Stewart and their Meridian compact disc system - shown here in a state of undress.

exclusive UK distribution of van den Hul, and are keen to continue the association according to Mr Bolt.

A press release from Automation Sciences confirms that an administrator was appointed before Christmas to effect 'an orderly restructuring of the company'. There is nothing wrong with the products though, and ASC are still selling: Burmester, Cello, Conrad-Johnson, Eminent Technology, Infinity, P. Lurne, Martin-Logan, Motif and Tiffany.

Jacob Zelinger, who runs the firm, explained that the stock market crash had badly affected his 'high-end' share of the market. Many dealers had suffered a 30% drop in sales in the Autumn which had rebounded something-fold on him. But he stressed that he had the support of both dealers and suppliers, and expected to be out of the crisis in the next three or four months. New products could also be expected from AS in the 'near future'.

B&W LOSE BOWERS

John Bowers, 21 years chairman of B&W Loudspeakers, has died



John Bowers.

aged 65. Bowers retired in November following ill health and had only just handed over the running of the company to Robert Trunz - the new chairman. Paul Messenger takes an appreciative look at his legacy to the UK hi-fi industry in this month's *Perspectives* feature.

SPEAKERS IN THE CITY

TGI plc, Tannoy, Goodmans and Mordaunt-Short's musketeering stance in the loudspeaker industry, may soon be 'acquiring' new blood after a successful listing on the stock exchange. On January 14th TGI was capitalised at £21.6 million in an over subscribed issue of 6,538,460 ordinary shares of 1p each at

130p per share.

At a press conference after the issue Terry Bennett, TGI's chief executive, said there was a likelihood of acquisition if the right company (not necessarily a speaker maker) was found.

The new money raised by the group will be used partly to redeem the term loan for Mordaunt Short (bought last February) and put in a pool for



Terry Bennett, TGI's Chief Executive looking happy.

the three companies a spokesman said. While all the members are for TGI, TGI is for all of them and it was stressed that each would continue to be run autonomously. The benefits of coming together were cited as collaboration in marketing strategy, product development and improved purchasing and production.

Although Mordaunt-Short is the smallest, and youngest of the group Mr Bennett said TGI envisaged it becoming like a British Bang & Olufsen. Questioned later Chris Short (who had hardly slept the night before the issue) didn't blink an eye: "if we can become known for our styling like B&O I shall be very pleased," he said. It would, however, be a B&O style with a five year guarantee he added! MS' first stab at amplifier design has just hit the streets in the sleek shape of the *MSA5000* (£340).

RUSH IN BOOTS

Boots say they have launched a winner with the introduction of the affordable CD costing £3.99. They claim to have sold around 170,000 in the first six weeks since the 'Compact Selection' range came on the market. The firm admit that business would have been boosted by the Christmas period but say sales will remain buoyant and are

planning to add more titles to the existing 50. To date the musical content has been classed as classical, nostalgia, jazz and easy listening – Boots are hoping to include more popular music.

SANYO/FISHER

Sanyo and Fisher have spliced their sales teams together to create opportunities for expansion. From now on the reps will wear first one and then the other company hat when they talk to dealers. The 27-strong sales team is being run by Paul Smith, the former Sanyo marketing director who now takes on responsibility for both brands. Sanyo and Fisher are based under the one roof in Watford but a spokesperson said: "the average consumer will continue to think we are different companies."

Sanyo effectively owns Fisher but the decision was said to be mutual between the two firms. There will be no change in the products and in the hi-fi field Fisher will be sold as the more upmarket of the two brands. Both companies said the marriage made economic sense.

The sort of products that will be sold in the tandem operation include new stereo TV's from Fisher. A 25 inch (£649) and 28-inch (£699) version are available in the FTS series which are both Nicam and CDV compatible and can be wired to your speakers.

HIGHLAND LINE

Hinari, the Hibernian consumer electronics group, are at last building a factory in the auld country.

The Glasgow based company are spending \$1.5m as an initial investment for a new site in Cumbernauld in Scotland's Silicon Valley. Domestic appliances such as kettles will be produced at first but the firm say CD midi systems and CD players will be produced from May this year. The 80,000 square foot factory will create 200 new jobs from the outset and is envisaged as the firm's research and development centre in the future.

Hinari's products are made in Japan and the Far East at the moment and the company will keep these bases. At present it claims a 10.3% share of the midi-system market and is hoping to expand further, pushing back the barriers in this country as well as Europe.

So Hinari's a name to watch. But no-one seems to know where the name comes from (it doesn't even sound Japanese). Answers on a postcard please.



Fisher's Audio Visual friendly designer series stereo TV.

AIWA'S WELSH EXPANSION

Aiwa UK Ltd are planning to double the output of their factory in Gwent South Wales with a \$3.1 million cash injection. The factory currently produces midi-system components, namely: amplifiers, tuners, cassette decks, turntables and CD-Players. Personal stereos, car audio and some video production is envisaged for the future. Aiwa also have a \$400,000 Regional Selective Assistance grant from the government which will be used in the building expansion programme.

Aiwa say 200 jobs will be created by the injection, and are using Gwent as a platform to increase its UK exports to Europe by 100% by 1990. The company have been in Wales since 1980.

PRODUCTS BIAS & ELYS

Clearly Rega didn't spend a six-figure sum with Saatchi & Saatchi Global Marketingspeak Inc when naming their two new cartridges. But at least they had the gumption to come up with something less prosaic, predictable and anonymous than *RB1000* or whatever when christening the new babies.

New models from Rega tend to appear at longer than two year intervals, so the simultaneous arrival of two together is an unprecedented event. Naturally enough they share a certain amount in common, both with each other and the *RB100* predecessor. But as usual Rega do it differently. Whereas most cartridge manufacturers happily build a range of different stylus

assemblies in a common body, Rega have retained the cantilever/tip developed for the *700* for both these models, and instead created a new (common) coil structure within two alternative bodies.

Rega's philosophy here has been to reduce the magnetic losses through tighter tolerancing within the coils and pole pieces, and to improve the mechanical integrity of the whole at the same time. They have always tried to avoid the widespread moving magnet technique of boosting the treble region by tuning an electrical resonance between cartridge inductance and pre-amp capacitance – the *RB100* having a decidedly dull balance for that reason. But halving the gap between magnet and poles, and winding the coils tightly directly onto the permalloy shafts has markedly reduced the high frequency losses – redressing the balance as it were while retaining the resonant 'sweetness'.

The difference between *Bias* and *Elys* lies in the price and the bodywork. The \$34 *Bias* has a superficially conventional 'universal' body, whereas the \$66 *Elys* has a tripod fixing not dissimilar to the Linn *Troika*, though with one crucial difference – *Elys* has the extra mounting at the front, and is designed specifically to partner the *RB250* and *300* tonearms. In many ways more logical geometrically than *Troika*, *Elys* has a captive thread in the moulding to avoid fouling the cantilever/stylus with the front screw.

The new bodies differ from most rivals and follow through the theme of Rega's successful tonearms by being single one-piece mouldings, incorporating the mounting for the curiously irregular rhomboid bung and the location holes for the pole pieces. Brief auditioning of a prototype suggests Rega's new cartridge entries could prove as influential as their tonearms have been.

AIWA'S WALK – KING

Aiwa are helping move the personal stereo business further upmarket by introducing their all singing/dancing *HS-JX101*.

The flagship of the range, this 230 gram machine boasts the ability to record auto-reverse, and has a tuner with three AM and three FM presets plus LCD display giving the tape mode, station frequency and time of day.

There is also a 'remote' control facility allowing the user to



Something to get your digits on, Aiwa's all singing/dancing HS-JX101.

operate the Walkperson with a small handset (microphone within) while the machine is tucked under the armpit, or whatever. Aiwa have also developed a built-in Ni-Cad battery recharger; folding headphones complete the compact system.

The *HS-JX101* retails at £249 but Aiwa do not claim it has the recording or playback capabilities of Sony's *ProWalkman*. And a spokesman admitted that better playback performance could be found elsewhere in Aiwa's lineup (of 12 peronals) specifically in *FX-101*. But for gadget city people, the *JX-101* must have it.

DUAL CHALLENGE

Hayden Labs, who market Dual turntables in the UK, are tentatively introducing other models from this German manufacturer's range. The company is considering importing three cassette decks, two amplifiers and a tuner from Dual. They will initially be sold through the Richer Sounds Group outlets. David Allen, speaking for Hayden Labs said: "We can see a hole between the mass and more hi-fi end of the market, and we think this new range comes at a very promising price point." The models are styled to go with the new turntable range.

The amplifiers are the *CV 6010* (£109) which is a five input, 35 Watt per channel model, and the 60W per channel *CV 6030* (£149) which has six inputs and a five-band graphic equaliser. The £149 digital tuner is labelled *CT7030* and has 40 (yes 40) presets on three bands. Three cassette decks – the £129 *CC8010*, the £199 *CC8020* and the £259 *CC8050* – all come with Dolby B and C, LED meters and microphone inputs. The *8020* is a twin cassette deck with high speed dubbing facility (for all you hasty bootleggers), and the *8050* is a three-head type with a simple scanning facility that allows the user to leap a track.

TONED DOWN

Technics are launching their new range of products over the next two months. The lineup includes

four CD players, two turntables, a tuner, speakers, two pairs of headphones and a couple of graphic equalisers.

The *SL-BD20K* (£74) and *SL-LIK* (£170) turntables are both to be released in February. Two of the CD players, the *SL-P990* (£450) and the *SL-P770* (£350), will be in the shops in March. The rest of the equipment will be available in April and May.

Pictured is the \$450 *SU-V90D* amplifier which is the most expensive of the newcomers. It is available in silver or black and has six inputs with a by-passable tone control switch. Most exciting is the lack of flashing light meters in the shape of those electronic worms that expanded and contracted in stereo as if trying to leap out of the amplifiers that Technics (used to) make. Watch this space for the rest.

THE OC7 HAS A BIG BROTHER

The latest addition to the Audio Technica cartridge range is the \$400 *AT-OC9*. Incorporating micro-engineering technology developed for the aerospace industry, the *AT-OC9* is a cost-no-object version of the existing *OC7*. Like the *OC7* the cartridge body is made from aluminium but in this case is gold plated, it features a "Techni-Hard" mounting base, and internal wiring is Audio Technica's continuous cast copper (PC-OCC).



Flying in at \$400, Audio Technica's new OC9 cartridge is in strong demand.

The stylus is an elliptical nude diamond on a beryllium cantilever, and output is a healthy and is adequate for most moving-coil inputs. Compliance is just below medium and suitable for low to medium mass tonearms.

Following in the footsteps of the rave reviewed *OC7* this new model has its work cut out justifying the extra \$150 that one



Japanese feet and Ninja colouring for Technics' new amplifier and CD player, here soon.

has to shell out. But if it can, it may be time for the Koetsus of this world to start worrying. The word from Audio Technica is that they are having big problems satisfying demand, as they only have a handful of people capable of building the cartridge. If not quite in the Ortofon *MC3000* ballpark, the *OC9* still looks like becoming a cult cartridge.

PAPERBACK CD

Lovers of classical music and the CD medium now have the same reference as lovers of good food and restaurants – THE GOOD CD GUIDE.

Published by the people who bring you *Gramophone Magazine* the guide recommends over 400 recordings from Adam to Zemlinsky. Akai UK Ltd have supported the 200 page volume (cost \$5.99) and it includes "The Akai 50" favourite pressings.

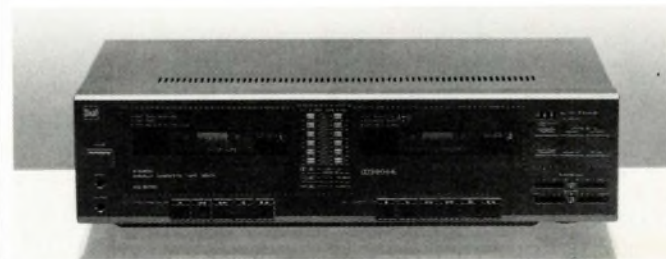
Readers also get potted biographies of the more famous composers alongside the reviews of their recordings, so that you can learn of, say, Bizet's philandering with his parents' maid, and can see their work within the pattern of their life. An informative glossary of musical terms accompanies.

Raising the hackles on the back of analogue-disciples' necks, CD is described as revelatory, with outstanding sonic advances, ease of use and suitability for longer musical pieces in the introduction. Users of vinyl are seen almost as cardiac patients – having to get up and down the whole time and becoming 'infuriated' by surface noise or 'drop-out' with tape.

BUDGET MOSFETS

ITL are launching the new *MA-80* integrated amplifier to retail for less than £150, sporting a very basic but well finished fascia. Controls are limited to source select, power on/off and volume, though ITL maintain that this is a user friendly amplifier and admittedly it features a switchable headphone socket.

The technological claim to fame is the use of MOSFET output stages (unusual for amps of this price), for its rated 30 watts per channel RMS output. The company has been in business for just over a year now, the *MA80* joining the *MA-120* already in production, with a \$230 pre/power combination still to come. ITL are Portsmouth based and can be contacted on 0705 293051.



Dual separates: CV6030 amplifier and CC8620 dual cassette.

THE LOUDEST PART OF THE QUIETEST TAPE IN THE WORLD.



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For further information on any TDK product, please write to: Customer Services Dept., TDK UK Limited, Pembroke House, Wellesley Road, Croydon, Surrey CR0 9XW.



New features with the discrete head CR-4E cassette deck from Nakamichi.

NEW NAKAMICHIS

Cassette deck maestros Nakamichi, have four new models on the market this month.

All members of the CR series, styled like the current CR-5E and CR-7E top of the range models, they will replace the long-serving BX series models.

The BX-100E will be replaced by the £345 CR-1E with the addition of Dolby C to existing features. The £395 CR-2E replaces the BX-125E with all the 7E's features plus fine tune bias control and four digit LED counter. The BX-300E will be replaced by the CR-3E which at £595 is £50 below the 300's price. Nakamichi claim significant sound improvements with the CR-3E though it no longer has the pitch control facility.

A completely new and additional CR-4E model is also being introduced at a recommended price of £745. The 4E comprises all the features of the 3E and includes a manual calibration system to allow optimum bias and record levels to be set for each individual tape used. Nakamichi point to the differences even between tapes of the same type from the same manufacturers as giving rise to the need for the calibration system: using it is well worth the extra effort in terms of sound quality improvement, they say.

X EXPOSED

Exposure Electronics' new £399 integrated amplifier – codenamed X, pronounced Ten – is due in the shops about the time this magazine appears, and has already built a backlog of orders from enthusiastic dealers who have auditioned the prototype. It is a simple 'straightline' unit with cartridge input matching moving magnet types only. Power is delivered from a shielded 250VA transformer, with separate regulation to different stages throughout.

Exposure are also starting to sell into the US market. Chicago-based Audiophore are handling sole and exclusive representation and distribution, and report a very encouraging

response from their attendance at the Las Vegas Winter CES.

TECHNOLOGY VIDEO TAPE

Two items of video news this month are important enough to deserve mention in this hi-fi magazine. First (in order of announcement) is that Sony are finally going to market and manufacture VHS format VCRs – alongside their current commitments to both Beta and Video 8

Several obvious factors made pride swallowing the only rational course. Sony can get 20% or so of any market they choose to enter, and 20% of VHS' 90% share of the video market is worth much more than 100% of Beta's 5%. Furthermore A/V integration (such as it is) has been largely software-led, and VHS dominates the videogram market, so staying out would have prejudiced future big ticket A/V system competitiveness. And knowing Sony there must be a good chance they'll have some useful tricks up their sleeves when they do get their own machines together.

More important still is JVC's long delayed publication of the European (PAL/SECAM) spec for Super VHS – nearly a year after NTSC S-VHS appeared in Japan and the US. Fully compatible with standard VHS replay, the Super option uses the latest tape developments to improve picture resolution dramatically – theoretically ahead of broadcast quality.

Unfortunately, new Super tapes recorded on the new Super machines do not replay on standard VHS hardware, so the changeover on pre-recorded material is likely to be painfully slow (but at least there is no longer PAL/SECAM colour incompatibility). Nevertheless the arrival of S-VHS must pose a threat to the future of CD-Video – the latter probably better on audio quality but theoretically losing out somewhat on video quality (not to mention record capability and all that jazz). And of course the market for VHS music videos already exists – and is comparable in size to the whole CD software market for that matter.

NAIM '88/1

Naim Audio have started to reveal their plans for 1988. The new year started with a major step forward in manufacturing technology, making the important step from CAD (computer aided design) to CAM (computer aided manufacturing) with the installation of computer controlled component insertion machinery.

Though cheaper than most

such systems, the Robin (robot insertion) from Dorset manufacturer Ambotech is still capable of handling 80% of Naim's component requirements. It operates 5-8 times faster than an experienced manual board builder, with excellent consistency as well.

Though happy enough to churn out any required sequence of Naim's standard PCBs (printed circuit boards) day in and day out, Robin will also be useful in development work. An engineer uses the CAD system to help lay out a prototype board for assessment, drawing on the machinery's data bank of component size and shape and printing out the masks for cutting the board tracks.

While the board itself is being made, the CAD computer squirts information over to Robin, which will calculate the precise coordinates and orientation etc. and draw up the loading inventory of the components, ready to start stuffing as soon as the board is ready.

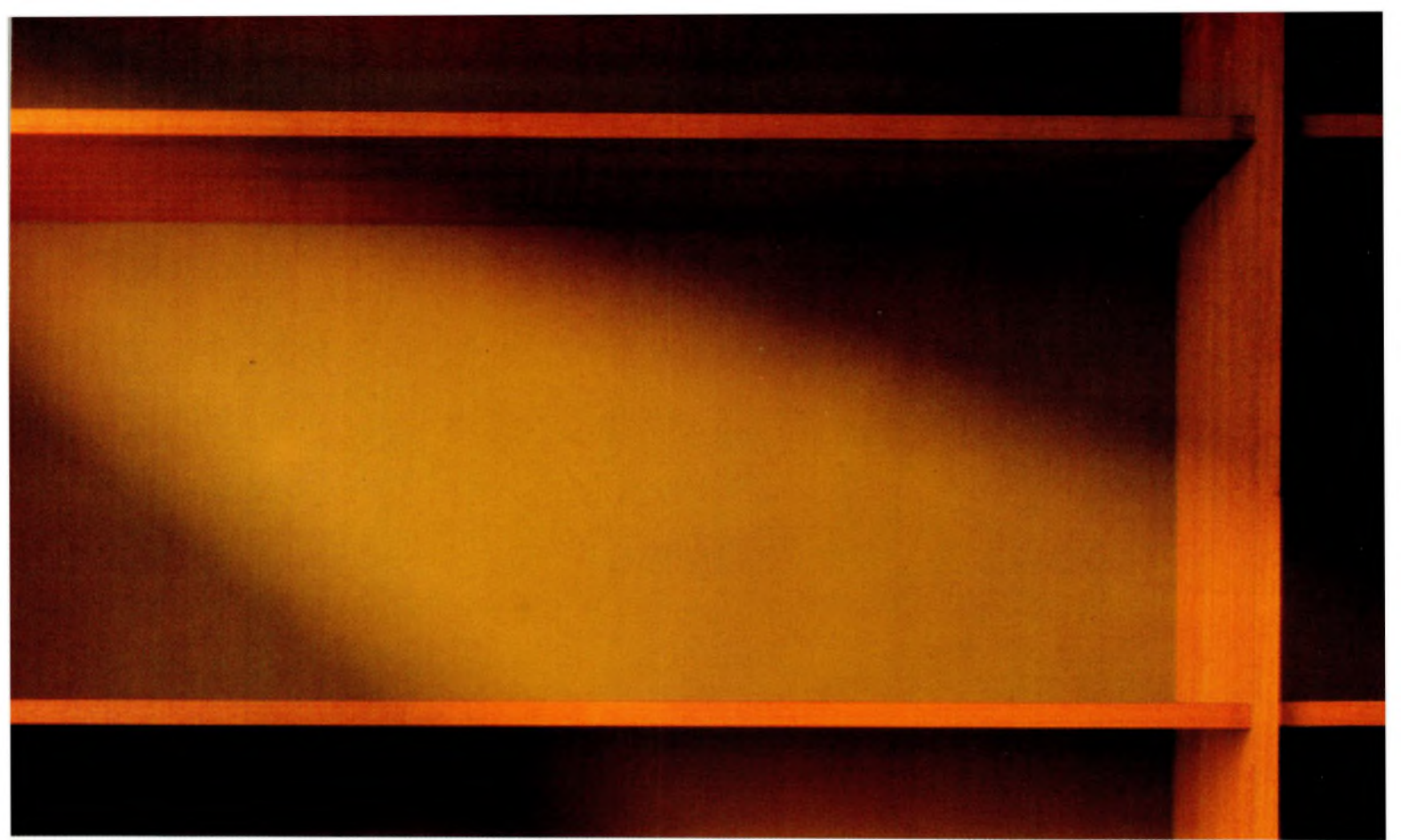
Naim have difficulty finding staff down in prosperous Salisbury, so far from making anyone redundant, Robin will free existing personnel for other duties. For example in loudspeaker assembly, where Naim have been expanding rapidly. The £1,000 SBL (separate box loudspeaker) suffered various early production hiati, but is now trundling along near 100/month and still failing to catch the backlog. Now they are to introduce a down-sized and down-priced £600(ish) version, currently code-named BL2, incorporating much of the unusual detail engineering of SBL but in a single (albeit three-chamber) box.

The bass/mid unit is currently SonAudax sourced, but with similar mass-loading and phase plug modifications as those applied to SBL's M-S driver. The floor-spiked stand is again integral, but uses controlled decoupling at the enclosure interface. The tweeter too is decoupled from the enclosure, at around 100Hz by means of its mounting plate. Once again a dual chamber system separated by acoustic resistance loads the bass/mid driver, and mass damping is applied to some cabinet panels. The 'plug-in' rear panel 3rd-order crossover facilitates active or passive operation.

Retaining similar proportions and shape, with the unusual part slanted front and convenience of wallmount alignment, there are naturally slight tradeoffs in bass extension and sensitivity.



Naim Audio's Julian Vereker welcomes his new robot board stuffer.



**Spend £250 on CD, and you'll
Spend £250 on a cart**



When you have more than £150 to spend on a cartridge, you are into a new realm. The realm of the moving coil. Unlike the moving magnet cartridge you are probably used to, in which magnets are attached to the cantilever, the cantilever of a moving coil has very fine metal coils wound round it. Which makes it much lighter and far more responsive to the transients cut into the grooves of a record.

As a result, a moving coil cartridge gives a much sharper, more clearly defined sound, with appreciably greater depth and spaciousness. It will also pick up the leading edges of the transients; the more detailed elements of the music that moving magnets can miss.

A moving coil is more expensive, because it demands more costly components and highly exacting engineering. But it will not only make your records sound much better. It will actually reveal subtleties in the original recording, which you never knew existed. To say buying a moving coil cartridge is like getting a new record collection is no idle boast. **FIRST THEN. FIRST NOW.** Back in 1948, Ortofon were the first people to produce moving coil cartridges. Prior to that, the company had spent many years using the same principle in the construction of state-of-the-art cutting heads.

This parallel between the manufacturing of records and their reproduction explains, in part, the superior accuracy of moving coil cartridges.

Since then, Ortofon have been consistently developing and refining them. The MC30 Super exemplifies how much progress has been made.

The stylus is the new FG Type 1, named after Fritz Gyger, the Swiss diamond manufacturers who are the only company in the world capable of cutting such a minute diamond with the necessary precision.

need a new record collection. ridge and you'll have one.

Its shape has been designed to make contact with the walls of the groove, where musical information is embedded, without touching the bottom and picking up surface noise.

The aluminium cantilever is tapered, to eliminate standing vibrations which can start distorting sound at source. And the coils surrounding the cantilever are made from pure silver, one of the finest conductors known to science.

To get the best from such sensitive components, the cartridge body must combine minimum mass with maximum rigidity, to prevent resonance. To achieve this, the MC30 uses two aluminium extrusions, bolted together for extra rigidity, and a carbon fibre base-plate, to repel static.

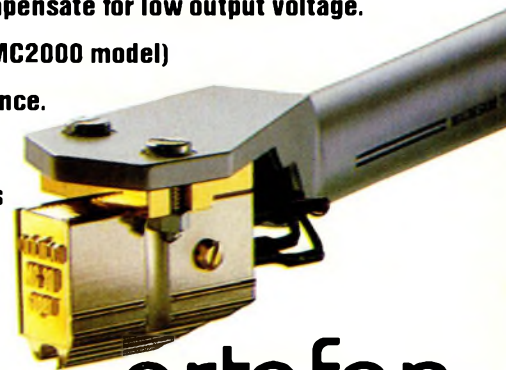
HEARING IS BELIEVING. While delivering superb sound reproduction, the MC30 Super also avoids a drawback traditionally associated with moving coil cartridges. Namely, the need for a step-up device to compensate for low output voltage.

A tiny, cross-shaped armature (originally developed for Ortofon's legendary MC2000 model) allows extra coil windings, without an increase in mass or any reduction in performance. And a more than adequate voltage output of $>0.2\text{mV}$ at 1kHz.

You can get full information on the MC30 Super and other models in Ortofon's moving coil range, by writing to: Ortofon (UK) Limited, Denmark House, Tavistock Industrial Estate, Ruscombe, Twyford, Berks RG10 9NJ.

But an even better idea might be to take your favourite album along to your nearest Ortofon dealer, and ask to hear it through an Ortofon moving coil cartridge.

The few minutes you spend doing so could make you think twice about spending years building up a new collection.



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To hear audio systems that will make your ears sit up and beg for more, make sure you listen to Musical Fidelity. Lead the way to your hifi dealer and ask for a demonstration. For a free colour brochure ring 01-900 2866, 9am to 5pm, Monday to Friday.

MUSICAL 
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AND THE SHOW GOES ON . . .

The intrepid Paul Miller survives aviation dramas to bring back fax'n'info from the 1988 Las Vegas CES.

This year's Winter CES was one of the largest yet, encompassing the broad categories of 'audio, video and home information'. Over 1,400 exhibitors were crammed into the Las Vegas Convention Centre and surrounding satellite hotels. Most exhibitors and many of the 105,000 trade attendees were to be found struggling within this vast Convention Centre; the writhing mass of bodies occupying this 3/4 million square foot venue rapidly gave rise to its popular nickname 'The Zoo'.

In addition, the show incorporated a wide variety of workshop programmes, special exhibits and events. The question of home taping, the launch of DAT and any subsequent infringement of *consumer* rights was one aspect held high on the agenda. A special booth entitled 'Right to Tape' featured the DAT recording of live music in order to demonstrate the potential capabilities of the medium, while a mass of accompanying literature documented the views of musicians, the Home Recording Rights Coalition, journals and the popular press as support against restrictive legislation. A judicial and legislative chronology compared the copyright infringement battles endured by the manufacturers of domestic VCRs with the current round of recommendations concerning the application of CBS's encoding system and the use of anti-recording ICs in production DAT players.

Perhaps as a result of perceived hostility from the American Congress, the profile of Japanese DAT machines (and CDV, for that matter) was notably low-key throughout the show. The digital products were there but nobody was going overboard to point this out. And the American audiophile community are clearly dead set against CBS and Copycode.

Following hard on the heels of TDK and 3M, BASF also introduced a DAT tape, claiming a dynamic range of 96dB and frequency response of 2-20,000Hz through the use of ultra-fine metal pigments. Denon unveiled a prototype *DTR-AX* DAT player, which includes their proprietary 'Super Linear Converter' topology in an effort to reduce conversion errors at the MSB (most significant bit). Harman Kardon showed their new 26 DAT player under the *Citation* banner, reflecting the likely



\$2000 cost of the machine. Other models included the Onkyo *DT-2001* (with comprehensive opto coupling and a sub-code editing function); two Sanyo units, the full-sized *DRD-01* and in-car equivalent (playback only); three Technics players, the *SV-D1000* (soon to be superseded by the *SV-D1100*), *SV-MD1* for portable use and a modified unit for in-car applications. Yamaha also showed a very pre-production sample of the *DTR-1*, a precursor to their domestic DAT machine.

Meanwhile over at the nearby Riviera Hotel, the CES equivalent of London's Penta Show was fully underway. Unfortunately, amongst many genuinely interesting products, there were others employing imaginative marketing hype to get themselves noticed. Bedini were showing a range of power amplifiers including the *BA802*, which apparently offers 150W per channel Class A for \$1300 from a rather slim case. When questioned about the need to dissipate large amounts of heat (from the minimum wastage of 300W), I was informed that the amplifier could contain the heat because: "we are using MOSFETs, not Darlingtons". At this point I left, thinking that I had heard something just like that once before . . .

Kinergetics were showing a 75W Class A *KBA-75* power amp, that apparently incorporates a 9kVA transformer and a rather interesting hysteresis distortion cancelling circuit that is currently subject to patent application. Furthermore, their original Philips-based CD-player has not been superseded by the *KCD-20A* (14-bit, 4x) and upmarket *KCD-30* (16-bit, 4x).

A company called Dimensional Optics (Mavrick Marketing!) provided additional disbelief with their 'Silicon Laser Matrix Amplifier'. Built into an unusual truncated pyramid decorated by a thin red line, it apparently utilises a new output device with 10-20 times the current handling capability of MOSFETs, while processing

the audio signals in the *optical* domain!

Now available in the UK, the Sumo range of amplifiers looked – and sounded – fairly good, with a chunky 65W Class A power amp plus two Class A/B units rather poetically named *Andromeda* and *Polaris*.

Other sensible amplifiers include the broadening Rowland Research range, an established US company now venturing into modular dual-mono pre-amps with attractive gold/black fascias and touch sensitive switching. Their *Mono 3* power amplifiers look even more domestically acceptable, with champagne gold fascias mounted flush with side-running heat-sinks and devoid of unsightly carrying handles. The *Mono 5* and *7* resemble the traditional 'monster' power amps of legend, but include some favourable design features such as balanced inputs, massive power supplies, multiple parallel FET output devices, a high speed regulated supply that maintains power to the front-end in standby mode, no use of negative feedback and careful selection of all passive components.

Briefly, PS Audio demonstrated their new *PS 4.6* pre-amp with optional *M-500* power supply; Audio Research showed a static model of their new *D-125* hybrid FET/tube power amp (which is based on the huge *M300* monoblocks), alongside the *MkII* version of the *SP11* pre-amp. Convergent Audio Technology demonstrated a high-end minimalist valve pre-amp, next to Boulder who have an exceedingly well-built solid state *500* power amp, which is destined for both pro and domestic markets, possibly in the UK.

In one of my few opportunities to sit down, relax and *listen*, the Rowland Research system (including Goldmund *Studio* turntable, linear tracking arm, prototype Decca-like cartridge and the fascinating Avalon *Prism* loudspeakers) sounded quite superb. Clear, dynamic but unforced and wholly transparent, all types of music, from jazz and pop to classical, were a joy to hear.

Elsewhere it was rather difficult to assess the performance from different rooms because of the very wide range of 'reference' products being used. Names familiar to the UK, such as Krell, Audio Research, Magneplanar, Koetsu and Oracle were nowhere to be seen outside their own rooms. The modified suspension and

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luxurious gold-plating of Brooks Berdan's specially 'tweaked' Oracle turned more than a few heads I might add, while tucked away on the top floor Oracle themselves were quietly demonstrating the latest – stunning – version of the *Alexandria*

Most popular turntable seemed to be the attractive *Dark Star* from Simply Physics, which retails for only \$1250 including the JS Technology *ast-2* air bearing tonearm. Shaped as the name suggests like a three-point star, this belt-driven turntable uses an acrylic platter (*à la* Pink Triangle) and high mass (lead-filled) base decoupled with sorbothane feet and Tone Cone *Delrin* isolators

Another deck utilising the favourable vinyl impedance matching of an acrylic platter was the *Well Tempered Turntable* – sounding good, in at least three rooms, with the latest version of the matching *Well Tempered Arm*.

Winner in the extremely silly category was the \$15,000 *Nebula 1* turntable from the Gold Aero Technology Group. Featuring a 35lb stainless steel platter and driven *via* a wide section polyolefin belt, the rotating mass is supported on an air-bearing and Avonite (synthetic marble) subchassis. A three-point air-pneumatic suspension just managed to keep the whole affair afloat while *Triplanar* tonearm and Clearaudio *Veritas* m.c. cartridge did their best to retrieve the music! The accompanying tube power amps seemed very interesting, but the *RR1201S/Trapagon* loudspeaker system (with external crossover) appeared to represent a significantly weak link in this oddball system

In the digital arena The Mod Squad, American Audio Labs and Musical Concepts were showing decent solid-state modified Philips CD-players, while VTL, Melos and CAL had similarly modified designs on their books using valves in the analogue output stage. Incidentally, Vacuum Tube Logic had a stunning array of top-end valve power amplifiers including new 100W and 200W monoblocks using selected *EL4316CA7* and *KT88* tubes sourced from Gold Aero. Unfortunately, the UK market is probably too small for us ever to witness their introduction over here.

The US penchant for large panel loudspeakers was clearly illustrated by Sound Labs' vast electrostatic subwoofers, designed to complement their single-curved diaphragm fullrange electrostatic 'satellites', and claiming increased air displacement at LF through the use of two film elements. Acoustat and Martin Logan were producing good sounds, the latter showing *CLS*, *Monolith* and *Sequel* models plus a much larger prototype *Statement* electrostatic working with an active moving-coil bass tower.

In a highly contentious launch, Audire demonstrated what they claim are "the first true, fullrange ribbon loudspeakers".



Top to bottom: Martin Logan's *Sequel* (right) plus prototype *Statement* hybrid • Cambridge Audio's Series 2 prototype 2-box CD player, with 16-bit 32x oversampling • KEF custom fit wall mount loudspeakers and subwoofers • Dark Star turntable from Simply Physics • Beveridge System 7 loudspeakers, powered by VTL.

Arranged in a line-source (dipolar) array, some 12 separate ribbon elements appeared to be located beneath the light grille cloth; I wonder what Apogee make of this?

Vandersteen loudspeakers were sounding good in The Mod Squad room, while other large moving coil designs were being shown by Amrita Audio, BSC, Clements and VMPS. The Clements *RT-7* utilised an aluminium ribbon unit with transmission-line bass loading, while the VMPS *Super Tower* looked (and sounded) like the nearest thing yet to a coffin stuffed with poorly integrated drive units! Dahlquist launched two new *M-series* models whose contrasts the panel-like open baffle of the latest *DQ-20s*. Infinity were putting their main effort into launching a new range of in-car loudspeaker systems. Beveridge were proudly disclosing their tubular *System 7* with an active electrostatic panel above 400Hz and 10-inch Peerless polypropylene bass driver firing downwards – ugly, cumbersome and physically unstable.

But what of the die-hard British contingent? Despite popular belief, they were not to be found malingering about the bar, but were working hard and generally producing good noises up on the top floor. Alpha-son were enjoying some success with their new *Sonata* turntable (apart from some initial grief concerning motor noise), Systemdek were displaying the latest versions of their popular decks, while both Celestion and Tannoy were blowing away allcomers with customary ease.

Cambridge Audio stole yet another CD technology lead by showing a preliminary glimpse of their new 16-bit player with 32x oversampling! Meanwhile A&R Cambridge were consolidating their ties with American company Audioquest, who are introducing several new cartridges and another range of hi-fi accessories. Redoubtable stalwards Quad, B&W and Rogers were all putting up a good show, the latter demonstrating the latest *LS5/8* derivative with 12-inch polypropylene bass driver married to a single treble unit.

Over in the main convention centre, KEF were also blessed with a good sounding room thanks to their new custom in-wall loudspeakers. Soon to be launched in UK formats, these comprise two- and three-way systems (the latter incorporating an optional 10-inch *CR250SW* subwoofer) that are flush mounted in the wall and loaded by the internal cavity volume. Installation and hook-up appears very easy, and the metal mesh grille may be painted any colour or swapped for a fabric cloth to match decor.

Apologies to those companies who (through limited space) have been omitted, but considering our Boeing 747 nearly took off with fuel leaking from the No1 engine, it was only by good fortune and the vigilance of the ground crew that anyone got a mention at all!



READERS WRITE CHOICE ANSWERS

IN AT THE DEEP END

After many years in an audio wilderness I have resolved to buy myself a new hi-fi system. To this end, I have toured the local emporia that purport to be selling the stuff and purchased every magazine that indicates a knowledge of the subject. Every angle that I have taken has led me back to your excellent publication, and hence I am writing to seek your advice.

I have not found a local dealer with either decent facilities or a reasonable range of stock and will have to travel forty miles or more to audition some equipment. So before embarking on this voyage of discovery I would like some ideas on hardware to consider. My last foray into the field was in the early seventies and it would seem that names have changed a lot since then, with British manufacturers apparently at the forefront for once.

I'd like to purchase a system comprising turntable, tuner, CD player, amplifier and speakers along with suitable stands and cables, preferably British and reasonably presentable. It will be installed in a modestly furnished fourteen-foot square concrete floored room, and for the most part will be used at 'lowish' volume. I had set myself a budget limitation of £1,000 but now realise that some flexibility may be required. On the basis of your reviews I am considering a CD player, tuner and amp from Mission, with a Linn Azzi turntable, K9 cartridge and Celestion DL8 speakers. However, I note that your *Separate Systems* article (issue 54) does not yield such a combination nor do any of the retailers who advertise recommended systems. I acknowledge that there may be other set-ups which are more mutually compatible and having based my selections on individual reviews realise that this may not be the ultimate combination. If the above gives the impression of a confused novice, then kindly take pity and try to point me towards the light.

G. R. BROWN,
CLAPHAM, BEDFORD

*Welcome to the minefield of hi-fi purchasing. It is fairly ironic that despite your extensive research into the field you seem just as confused (or more so) than when you started. One reason why your selected combination did not appear in the *Separate Systems* article is that it doesn't fit neatly into the price categories that were used, but it is definitely worth a listen as it certainly looks compatible on paper.*

Do assess whether you prefer LP or CD as your main source before purchase, and allocate your funds appropriately, as one or the other will probably end up being used the majority of the time, and determine the software format purchased.

Your best approach might be to arrange consecutive demonstrations at three dealers, specifying your tastes and financial limitations and letting the dealers sort out appropriate equipment. This way you will hopefully get to hear a good variety of systems in suitable listening rooms. Single speaker dem rooms are a must and a good basis for dealer selection.

REDUCED CIRCUMSTANCES

I have recently moved house and am looking for some smaller loudspeakers to replace my 15-year-old Ste Ma 5 units, which I believe are of Danish origin and are 15 x 24 inches in size. I am told that small modern speakers offer excellent sound quality and am looking for a pair to go with my Cambridge P35 amplifier and sources including Marantz CD63B and Pioneer PL12D. I have a budget of £200 for speakers and another £100 for an appropriate tuner, do you have any recommendations at this price level?

REV D R. P. ANGWIN,
LICHFIELD, STAFFS

These days it is possible to get some pretty impressive sounds out of small speakers, but sonic results depend on the tonal match with the rest of your system, siting and support. As much as any others, small boxes need to be well supported on rigid spiked stands and positioned

appropriately for the design. If space is at a premium (isn't it always?) then a design that works well up against the wall would seem sensible. The following models all prefer near-to-wall siting: Royd Coniston R (£149), Mission 70 II (£99), Mordaunt Short MS100 (£179). The change from your £200 should be put towards a pair of stands.

Our February issue contained recommendations for several tuners, and I would refer you to that for guidance. An important factor to consider is whether or not a good external aerial will be provided, as some tuners work a lot better without them than others.

AIWA GRUMBLES

I was the proud owner of two Aiwa cassette decks, ADF1800 and ADF160, until the latter broke down because of a logic circuit fault.

In June last year I returned the ADF 660 to my local dealer. After a service that cost me nearly £20 and failed to cure the fault, the shop contacted the Aiwa service centre who said that the deck would have to be sent to them for repair. That was nearly six months ago and I still haven't had the ADF 660 back. I would have recommended Aiwa cassette decks to your readers as quality hi-fi products, but their servicing time is so long that I for one do not intend to buy more of their products.

G. E. HILES,
WARRINGTON, CHESHIRE

This is not the first letter of complaint that we have received about Aiwa's servicing record, but hopefully if the right people get to read this, it may be the last!

WHERE DO I GO FROM HERE

I presently run a Linn LP1 2 with Basik arm and K9 cartridge, feeding an A&R Arcam Alpha amplifier which drives B&W DM2 loudspeakers. I have £450 available to upgrade the system but am unsure as to what would be the most effective way of improving the sound quality. I have considered getting an Ittok LVII fitted to the Linn but wonder

whether the money might be better spent on new speakers.
L. DYKE,
WELLINGBOROUGH, NORTHANTS

This is a situation where there is no obvious upgrading path to follow and it is necessary for you to assess, at least approximately, what you want your system to do. Assuming you are not upgrading for the sake of it, there may be something you feel is lacking, be it clarity, tonal accuracy or flatness of response. To replace the tonearm with the Ittok should give a definite improvement in all of the above respects, but may not have the desired effect on the tonal balance of the system.

From what I can glean about the DM2s they sound like quite good speakers and to replace them with something better would take the greater part of your budget. A better pair of speakers should be more informative, hopefully tighter and probably image a bit better, but are not necessarily the best way of increasing the fidelity of your system.

What you really need to do is to upgrade both your tonearm and amplifier either in steps or at the same time. If you don't anticipate having extra funds in future you could do worse than fit a Rega RB300 tonearm, which although not as good a match for the Linn as the Ittok, represents a significant improvement over the Basik and is inexpensive.

The amp should be carefully selected by dragging the DMs down to your dealer and listening hard. Some models that you should bear in mind are Audio Innovations' integrated valve amp (£300), Myst TMA3 (£288), Audiolab 8000A (£325) - all models which offer excellent sound quality at the price, though they may take some seeking out.

CUT THE CRACKLE

Following an article by Ken Kessler in *Hi-fi News*, I bought a set of Sennheiser HD540 headphones which I use with my Linn Sondek, Rega RB300, A&R E77 front end and Audiolab 8000A amplifier. As you know

headphones are particularly revealing of surface noise – clicks, pops etc, and reading between the lines in *Hi-Fi Choice* cartridge reviews I am drawn to the conclusion that certain cartridges are much more susceptible to this sort of noise than others. Whilst cost is not a great problem I don't want to spend a large sum on a cartridge only to hear extraneous noise better than before. Perhaps there are one or two cartridges that you could recommend which would take advantage of my system and minimise surface noise.

R. B. CONNELL,
NORTHUMBERLAND

Oddly enough we came across a similar problem recently while reviewing headphones for the February issue, although the problem was more hum than surface noise. At the time I tried out a Goldring Eroica L cartridge instead of my usual Logic Claro Black, and this was definitely quieter and more suitable for headphone listening, surface noise being for the most part negligible. Included in that test was a pair of HD540 Golds, which are presumably an upgrade on the ones you have and which we found very revealing and slightly hard sounding, though this could possibly be to do with the Nytech amp I was using. Nonetheless the 540s were hard to please and required something of the standard that the Eroica offered. A cheaper possibility is the Rega RB100 (£38) which has a somewhat 'duller' balance than most.

However, surface noise is unfortunately as much a contribution of the player and arm as the cartridge. If it hasn't been checked for a while, getting the Linn set up again may also help reduce the problem.

BUILDING BACKWARDS

I am looking for a suitable amplifier to use with my Sony APM 22ES loudspeakers. The Yamaha AVC-30 appealed to me, but having read some less than wonderful reviews I'm not so sure. Primarily I am after good sound quality and not too

concerned about features, flashing lights etc. I would also like to know what output power is required for my speakers which are rated at 80 Watts per channel.

I have a budget of £800 to cover a turntable, auto reverse cassette deck and the amp. Do you have any suggestions?

M. S. PANESAR,
CHATHAM, KENT

Building a system from the speakers backwards is a slightly unusual approach but doesn't necessarily create any problems as long as they are included in your auditions for a suitable amplifier and turntable.

Worry not about loudspeaker power handling ratings – they are largely irrelevant to normal conditions of use, and of interest only to headbanging party givers. The APM 22ESs have a voltage sensitivity of 88.5dB/W which is about average, and an easy load for most amplifiers. So what sort of model should you be looking for?

Given your budget the following turntable, cartridge and amp combinations would be well worth auditioning; Logic Tempo/Datum II with Audio Technica AT-F3 and Cambridge P40, or Manticore Mantra/M8, Nagaoka MP11 Boron and Myst TMA 3, or even a Linn Axis, Linn K9 and Naim Nait. These set-ups retail for around £600 which leaves you enough for the budget autoreverse cassette deck which we recommended in our last reviews – the Yamaha KX-400. But for this latter component it might be worth waiting for next month's issue which is primarily about cassette decks.

STARTING OUT

I wish to buy a complete series of hi-fi separates. After reading the *Hi-Fi Choice: Best Buy Guide*, published last October, I decided on the following equipment: Dual CS505-2 turntable, NAD 3020E amplifier and B&W DM100 loudspeakers, with the Rotel RT-850L tuner, Denon DR-M07 cassette deck and Philips CD160 compact disc player.

I would like to know if this combination of equipment will

work together, and whether the amplifier is matched to the loudspeakers. As I can only afford some of these components for the time being, would it be best to get the amplifier, speakers and cassette deck first?

S. CROOK,
HALIFAX, W. YORKSHIRE

All the products you have chosen achieved our recommendations as being good value for money in sonic terms, but the Dual may take a bit more seeking out than the rest as it has now been superseded by the 503-1 model. What is more important, however, is the sonic result of this particular combination and how it relates to the sound that you want.

In our January issue there is an article on systems, based on the recommendations of dealers, whose job it is to put together systems to suit particular pockets and tastes. And it is to your friendly local dealer that I would recommend you go and listen to the equipment you have selected. There aren't any dealers listed for Halifax in our Dealer Directory, but there are several around the country. Alternatively, a member of the Hi-Fi Markets chain should stock most of the equipment you have selected.

As for which components you buy first, it would seem logical to go for the one that suits the majority of the software that you presently own. So if you have a significant cassette collection then get the cassette deck, not forgetting the speakers and amplifier of course.

CD READY?

My present system includes an ancient Sony TA 1010 amplifier, Dual CS505-1 with the standard Ortofon cartridge and Celestion Ditton loudspeakers. I want to add a CD player and am interested in the Philips CD373, however, I am concerned that my amplifier may be a bit dated for this new medium. The only spare input available is marked auxiliary – is this suitable?

Would you recommend I upgrade the amplifier to something like a NAD 3020E or

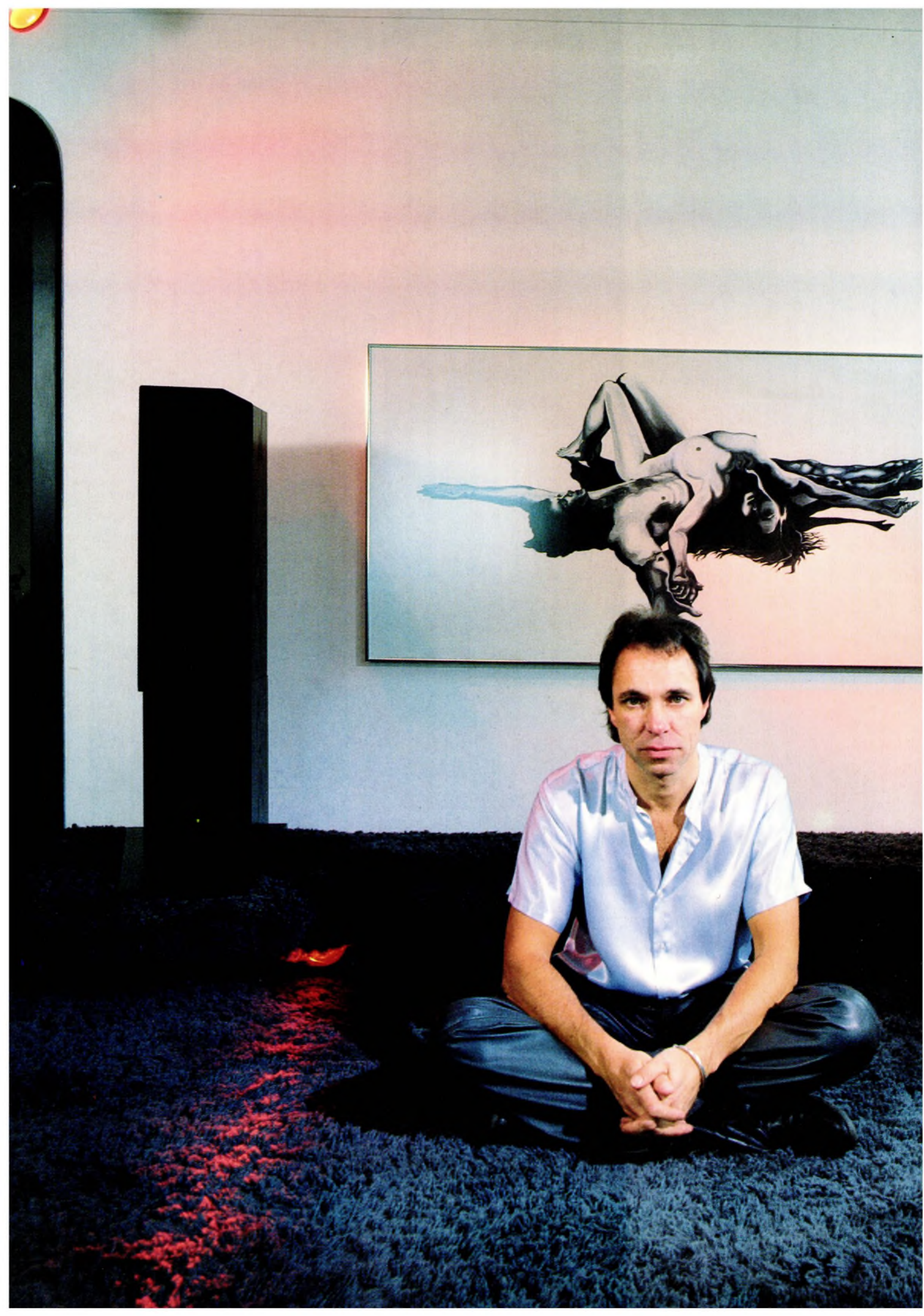
the more expensive Mission Cyrus One, and is the latter worth the extra outlay involved? I'd also like to upgrade the cartridge and speakers, and have been recommended the Audio Technica AT95E – what would you recommend for up to, say £50. Loudspeakers I have considered include the Mission 700LE, Tannoy Mercury II, AR 18BX and Celestion DL6.

J. PEACEY,
WATFORD, HERTS.

It looks like you are in for a complete system upgrade and as such it is worth buying the components as a sonically matched whole. It should not be absolutely necessary to replace the Sony amplifier, as its auxiliary input ought to be pretty well suited to a CD player. However, the sound quality benefits from replacing it with either of the amplifiers you mention should be well worthwhile – the standard of integrated amps has improved considerably since your Sony was manufactured. We rated the Cyrus One rather higher than the NAD, and the former has also recently been revamped, but both achieved Best Buy rating.

Of the loudspeakers you mention the Tannoys are Best Buy rated and both the Missions and Celestions are Recommended, though the latter have also been slightly changed since our review. Ultimately these components should be purchased as a complete system and not as individually recommended bits. See if you can find a local dealer who stocks some of this equipment and does single speaker demonstrations; then go and have a listen.

Finally let's look at a suitable cartridge for the Dual. Well the AT95E is a good cartridge for the price, but if you're prepared to spend up to £50 you could do a bit better with the Goldring G1010 (£34) or one of the A&R 77 models (from £20), any of which are suited to the medium mass arm on the Dual. There is also an exciting (but as yet untested) new Rega cartridge, due in the shops in the next few weeks for around £30 (see Update pages).





ASPIRATIONS

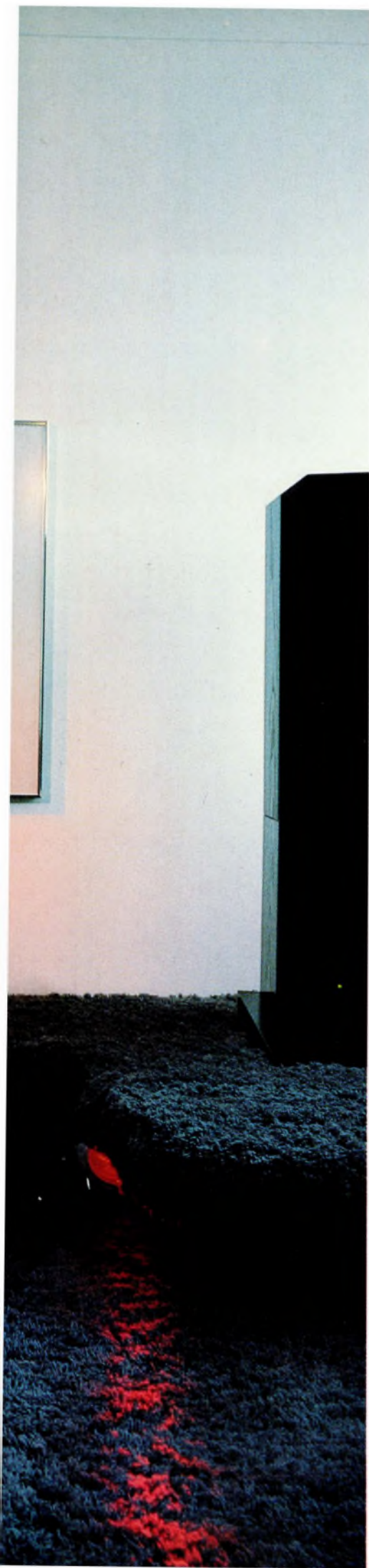
Monochromatic colour schemes may be a little cold on the eyes but Dentist Brian Lamberty has music to compensate.

FILLING IN THE

Colour

WITH

Sound



A controlled environment, Meridian's 209 remote unit blending in with executive toy on the coffee table.

This month's Aspirations makes a welcome contrast to those that have gone before. High tech components from Meridian, Nakamichi and Michell blend in very naturally with the high tech interior of a third floor flat overlooking Epping forest.

Brian Lamberty may be a dentist by profession but he's very much a designer by inclination. Having purchased the flat new a couple of years ago, before the builders had got started on the interior, he had the opportunity to control the room layout, happily sacrificing a bedroom to create an unexpectedly spacious lounge, which is segmented to accommodate both hi-fi and TV separately and successfully.

While high inherent equipment sound quality clearly plays an important role, aesthetics are clearly Brian's first priority, so a long term loyalty to the Boothroyd Stuart design partnership is far from surprising. Allen Boothroyd and Bob Stuart are Meridian's principals; Bob is the electronics whizz, while Allen's industrial design flair is seen in a number of current and past hi-fi products – Meridian's own, the Celestion SL6 and current KEF loudspeakers to name but a few.

The acid test for your hi-fi.



How would your hi-fi system measure up to a cassette that overall design gives superior reproduction quality?

Or a cassette that Epitaxial and Metaxial particles are smaller for a much broader, more dynamic range?

Or indeed, a cassette that superior sound quality verges on the pin-point accuracy and quality of a compact disc?



Well, you needn't just wonder how your system will fare, you can try one of Maxell's brand new Black Series for yourself.

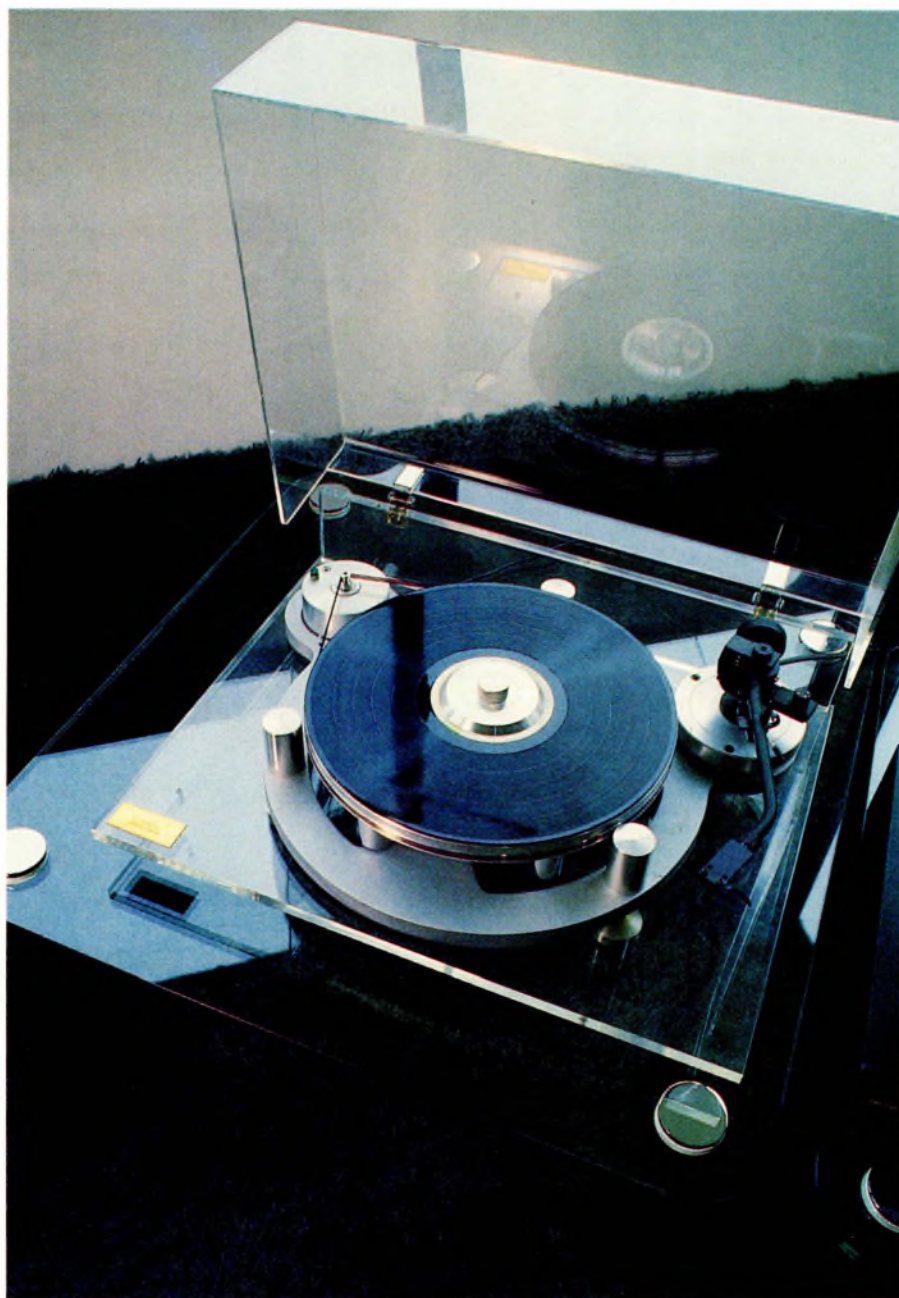
And we can guarantee, that although each one of the three new cassettes is designed with the coolest of matt black finishes, they will really make your system shine.

maxell
BLACK
SERIES

The stylish Nakamichi 700 ZXL atop more contemporary separates from Meridian, including the 207 CD player with drawer open.

Brian's affection for their stylish products started back in the Lecson days. Readers with longish memories will recall this as one of the most attractive amplifier systems ever designed – the pre-amp echoing Meridian's current 209 remote control unit. And it was while searching for the matching tuner that Brian first encountered Subjective Audio's Howard Popeck. This relationship too still survives, despite an inauspicious start with a string of faulty tuners at the tail end of Lecson's sad post-BS decline.

The next step was Meridian's 101 pre-amp and their first generation active loudspeakers – specifically the tombstone-shaped M1s. These were not necessarily the first choice aesthetically at it happens, and were only chosen after careful compa-



rative listening. That they were exceedingly loud and powerful 'big' loudspeakers that took up little useable room space was all buncie, as they say.

The 101 pre-amp and power supply units were even uniquely customised by a very attractive chrome finish – an elaborate procedure which first necessitated fabricating the casing in brass in order to take the chrome plating. Though temporarily in retirement they are about to be pressed back into service to drive a string of *Active Diamonds* throughout the even more high tech, self-designed practice premises that Brian is currently completing in nearby South Woodford.

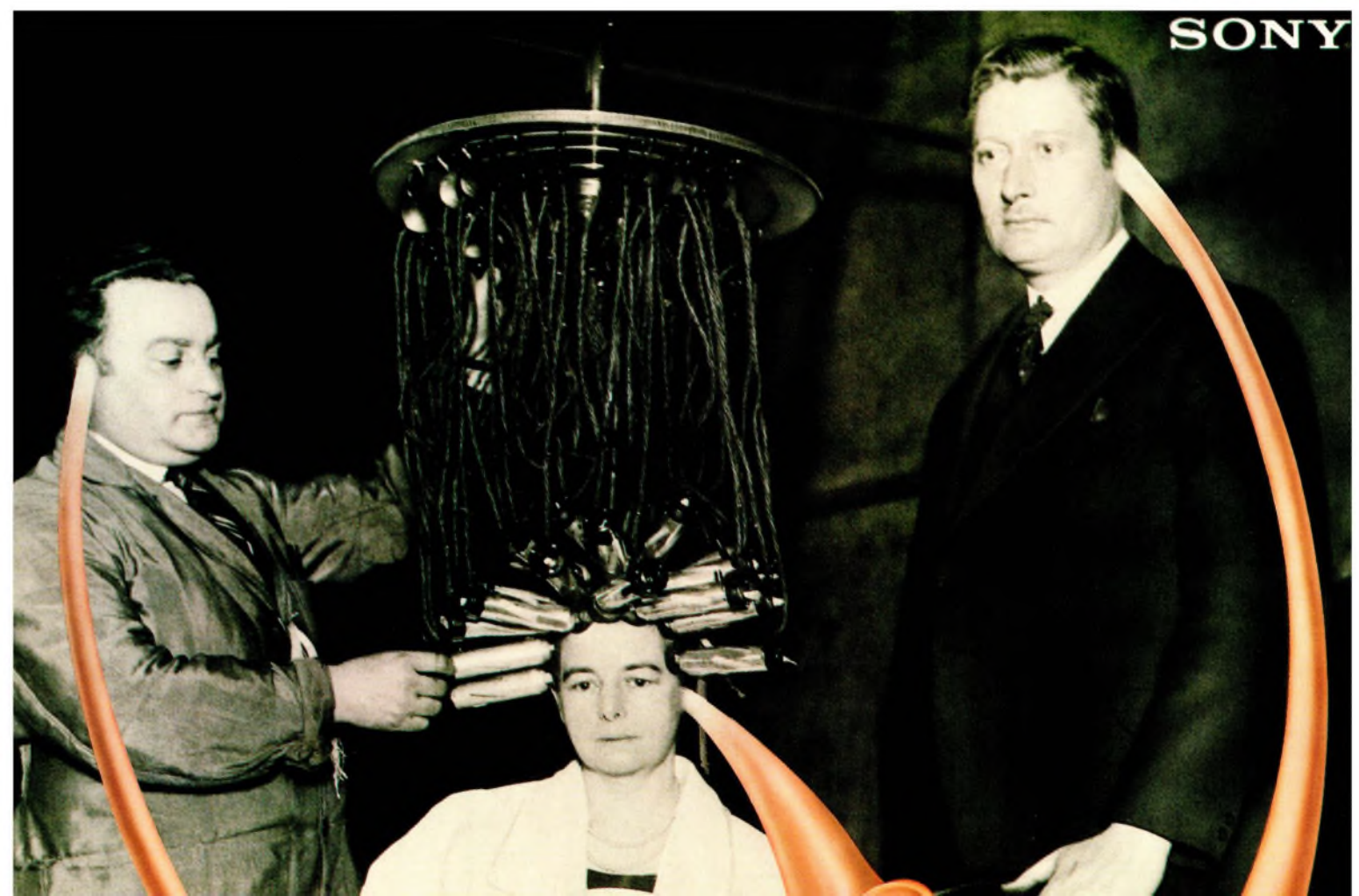
Of all the systems I have visited so far, I have to admit this one comes closest to my personal taste, with its restrained, almost sombre and monochromatic soft furnishings in greys and blues – enlivened here by glass and chrome (not to mention the odd erotic lithograph).

Though large and sparsely furnished, the room is far from featureless. Window area dominates the wall facing the woodland, and the main floor is broken up by irregularly shaped low dais' at each end, one supporting the unit seating, the other the imposing pair of active Meridian M100s.

Alongside chrome and glass, lighting makes up the triumvirate that dominate 'high tech' interior design. The overhead tracks and spots are familiar enough, but a particularly neat and original touch was the red and blue pairs of spots built into the dais edge at the loudspeaker end, one

Glass on glass; Michell Gyrodek with Sumiko Premier MMT arm and Talisman cartridge.

SONY





SONY TAPE. YOU'LL KNOW IT WHEN YOU HEAR IT.



A stately Nakamichi 700 ZXL and Dolby C external processor bearing down on a Meridian 201 pre-amp, 204 tuner and 207 CD player.

pair of which unerringly delineate the main forward axis of the two loudspeakers.

The driving end of the system is a reasonably compact trolley load, needing no power amplifiers of course. The neat row of four Meridian 200 Series boxes is discretion itself, providing the pre-amp, CD player and tuner, with full system remote control. In contrast the *Gyrodek* and Nakamichi 700 add more than their fair share of brightwork. Both designs have their roots firmly back in the 'seventies, and the Nakamichi has been obsolete for some years. Yet both set standards for modern styling that have yet to be exceeded, and are natural choices for the visually literate and the high tech environment.

Another intriguing pattern emerging from this series of *Aspirations* features is that there is virtually no overlap at all between the record collections of the different individuals. I would be hard pushed to name a single record I have seen twice in any of the homes visited so far or my own extensive collection. Brian had a good couple of hundred vinyl and CD modern funk and rock albums on a trolley alongside the equipment, yet it was quite distinct from my own extensive collection of mainly rock material.

Specially customised Meridian 101 pre-amp and 104 tuner with cases fabricated in brass and chrome plated.

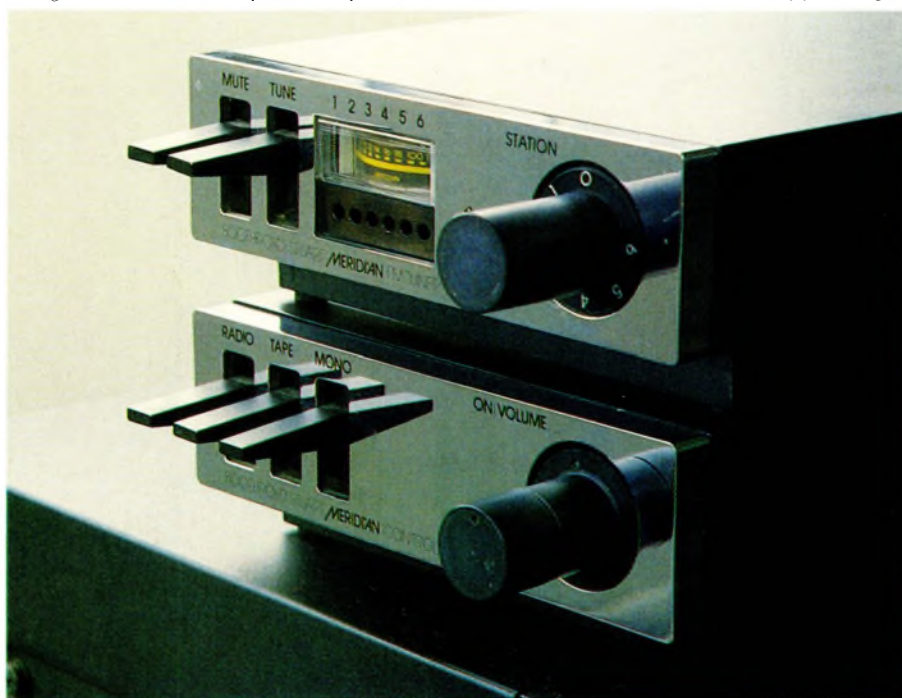
Once again it was clear that the individual and his dealer (the aforementioned Subjective Audio of Palmers Green) had together managed to arrive at a system which suited both aesthetic and sonic requirements. My admittedly limited experience of both *M1*s and *M100*s is that few loudspeakers are more effective at creating the disco experience in the domestic environment – notwithstanding designer Bob Stuart's personal predelic-

tion for chamber music. Active drive with plenty of power and drive units can produce bass extension and levels to make one fear for the structural integrity of the building, or the sanity of neighbours. Yet these are also civilised, even docile devices when ticking over gently and providing background music for conversation.

One strength of the *700* over its predecessor – and some of the competition Brian auditioned when making a replacement decision prompted by the accidental destruction of one of the obsolete *M1*s – lies in the fine stereo provided by its narrow, projecting baffle. Aesthetically, however, they appear to loom almost menacingly compared with the much less obtrusive *M1*.

Barring a prototype mockup, the one component I had not actually come across before myself was Meridian's *209* remote control keypad – the term does it faint justice. We are apt to take these typically nasty little plastic infra-red torches for granted, as part of the general detritus of modern living. Yet they are rapidly becoming ergonomically and aesthetically more important than the equipment itself that can often be tucked out of the way.

Only B&O have lavished comparable attention on the styling of their control units, and when it comes to gracing the coffee table alongside discreet *objets d'art* or executive toys, the *209* is in its own visual and tactile class for elegance. One could speculate whether its unrivalled aesthetic aptness to the environment determined the choice of the rest of the system. Unlikely to be sure, but it must certainly have made alternatives less appealing.





GO FOR GOLD!

ENTER OUR TWO-PART COMPETITION TO WIN THE SOURCE ODYSSEY SIGNATURE 100 – A £3,000 LIMITED EDITION FRONT END SYSTEM WITH GOLD PLATED ARM AND PLATTER

Chances are that if you had £3,000 to spend you wouldn't use it all on a state of the art record player. Well here's the opportunity to change that; the opportunity to win one of the most beautiful deck/arm combinations around – Source Odyssey's Signature 100. *Hi-Fi Choice* and Source Odyssey are giving away the first of only 100 Signatures being made, serial number 001. It comprises: The Source turntable with an exclusive black lacquer plinth and lavish application of 24 carat gold plating to many of its precision parts including the massive phosphor bronze platter; the Third Dimension power supply unit; handmade Odyssey *Signature* tonearm in gold plated

brass alloy. To complete the prize Audio Technica have supplied their £239 *ATOC7* moving-coil cartridge, *Choice* Recommended and described by Source as "the perfect match". The total retail price of this system is £3,239 and the lucky winner will receive an engraved plaque confirming ownership, as well as having the turntable installed by a Source Odyssey consultant.

To enter this competition all you have to do is answer the five questions (below) in this and next month's edition of *Hi-Fi Choice* and send the completed forms together to us. The first correct set of answers pulled out of the hat will win.

This month's questions are:

1. How many feet does The Source have?

2. Which American turntable has a clamp but no proper platter?

3. Who is the oboe in *Peter and the Wolf*?

4. Who wrote of men waiting "for that geranium Kiss"?

5. What does a U-Boat have in common with The Source?

NAME _____

ADDRESS _____

COMPETITION RULES

- 1) All entries must be on the entry forms provided. Photocopies will not be accepted and only one entry per reader will be considered. Entrants must submit completed entry forms for all three parts, in a single envelope. Incomplete entries will not be considered.
- 2) There is no cash or other alternative to the prize.
- 3) Employees of Dennis Publishing Ltd and associated companies, or their agents, or of the manufacturers and suppliers of the prize system components or their relatives are not eligible to enter the competition.
- 4) The competition is not open to readers living outside the United Kingdom.
- 5) The main prize will be awarded for the first set of correct answers opened. The Editor's decision shall be final and binding. No correspondence whatsoever will be entered into regarding the competition.
- 6) All entries must be received by Friday, April 29th 1988. The winner will be notified by post and the results will be announced in the July 1988 issue.

NB Please keep this entry form until you have completed Part Two (April issue) and then send both completed forms to: HI-FI CHOICE COMPETITION, 39 GOODGE STREET, LONDON W1P 1FD.

PERSPECTIVES

Music lover and perfectionist John Bowers was one of the key catalysts in twenty years of loudspeaker development. Paul Messenger visits the B&W research centre to find a remarkable technical legacy for the future.

THE

Bowers Legacy

John Bowers, founder of Sussex loudspeaker manufacturer B&W, died in December 1987 after a short illness. A mild and gentle individual – in some senses the epitome of the English gentleman – he was nevertheless a pivotal figure in the development of the British hi fi loudspeaker industry for over twenty years.

Throughout his life John ploughed profits back into the company, and was a great believer in investment in research. His legacy therefore comprises not only one of the largest and healthiest British loudspeaker manufacturers, with some 250 employees in the UK, distribution in 44 countries and a fully up to date model range. But also one of the most advanced acoustic research facilities in Europe, staffed by 20 or so highly qualified personnel, which is the main subject of this appreciation.

Whereas the four factory and distribution units are spread over the coastal industrial estates of Worthing and Lancing, the research laboratories are five miles inland at the pretty village of Steyning – near neighbours of tonearm manufacturer SME. Conservation planning policies keep the modern facility tucked away behind the village's mediaeval facade, with unposted access down the narrowest of roads.

R&D RULES

Bowers' foresight in providing this degree of detachment from the manufacturing hurly burly has fostered a quite different atmosphere from the normal factory-based lab. Product development and production engineering are still major elements of the daily round, but one is also inescapably reminded of the ambience of a busy University Physics department. Indeed, the close ties with the mathematics department of nearby Brighton Polytechnic are evident in its two Associates attached to the research center and currently in the middle of a two-year secondment, working

on finite element CAD (computer aided design) programming.

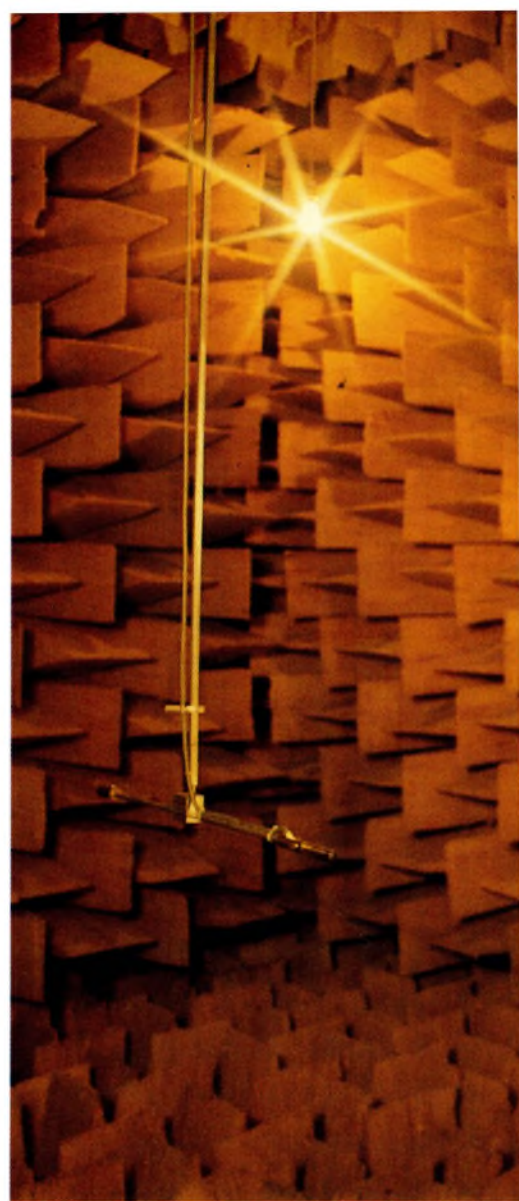
My whistle stop tour conducted by Dr Peter Fryer and Stephen Roe, heads of research and of product development respectively, involved exercising the brain



cells to an unaccustomed degree. My overall impression was amazement at the breadth and sheer diversity of the research that was going on and the techniques that were being adopted. Then there were the computers – at least a score of them all told – which are rapidly taking loudspeaker design out of the dark ages of alchemy, and towards the realm of successful scientific prediction.

ACOUSTICS

The research center is as well equipped as I have seen anywhere in the world. There's the obligatory anechoic chamber – and then a second one besides. Both have computer controlled testing and are heavily used, while the engineers add visits to the much larger Building Research Laboratories chamber at Garston when doing critical low frequency work. Then there's the 'bean



pole', which under (rare) favourable climatic circumstances can take the speakers 30m up into the air.

It is this 'belt and braces' approach that was most noticeable throughout the lab, whereby different measurement techniques may be applied to the same task in order to corroborate the validity of any findings, not to mention the test programmes themselves. In other words B&W can adopt several different approaches to answering any given question, so each acts as a check on the other methodologies. And given the complexities and subtleties that are still very much a feature of loudspeaker engineering, such strength in depth is very comforting.

LASERS

Besides the chambers and computers (of which much more anon), there are the lasers. The velocimeter uses laser doppler interferometry to examine loudspeaker diaphragm behaviour directly under various signal drive conditions. No longer a new approach, B&W were in fact the first in the industry to install a system as long as a decade ago. And the velocimeter remains a very powerful analytical tool, assisted by steady refinement in techniques and additions to computer processing speed and memory. The engineer can choose to



John Bowers (left) pictured beside one of his most famous creations, the 801 monitor. Steve Roe (above) supervises product development in anechoic chamber.

examine a drive unit from several different perspectives – using a single frequency or broadband impulse signals; focusing the laser on a single surface point or traversing across a slice. Given sufficient computer power and time it is possible to store full amplitude response and time decay data for every spot on the surface for comparison and analysis of all vibration modes.

Another laser-based technique that has proved very useful, mainly in qualitative rather than quantitative enclosure analysis, is ESPI (electronic speckle pattern interferometry). It can show up movement as small as 1/3000th of a millimeter by a technique akin to real-time holography, conducting interference between the speckle pattern shone on a signal-excited cabinet panel with that held in a frame-store. The technique was particularly useful when developing the advanced Matrix cabinet stiffening techniques that are now applied to B&W's upmarket models.

An alternative approach to cabinetwork is modal analysis. Energised by wideband impulse signals, the output from a geometric matrix of accelerometers positioned on

the surface of the enclosure can be recorded and mathematically analysed by a mainframe computer, giving a quantitative model of cabinet behaviour under signal conditions.

COMPUTER POWER

But the stars of the show are the computers and their remarkable software. A couple of slightly ageing mainframes are still in regular use on some tasks, but the research center as a whole now relies heavily on distributed computer power, mainly in a wide variety of BBC Micros that seem to litter every available bench. More powerful variations like the Cambridge Workstations are used where necessary, along with Olivetti M28 PC-compatibles where high speed and large memory are needed.

The computers are particularly useful in coping with the relationships between the large number of variable parameters the loudspeaker designer has to juggle. Complex CAD (computer aided design) programmes allow simulated try-outs of an infinite variety of drive unit and crossover elements or enclosure configurations, again from a variety of different perspectives, without the need for costly, interminable prototype building.

Indeed, the practical impossibility of

trying out more than a handful of likely physical alternatives when embarking on a new design brief has always been one of the limiting factors in past loudspeaker development. B&W's engineers can not only manipulate simulated parameters that cover the broad overall sweep of drive unit, crossover and enclosure integration, but can look at much of the fine detail besides, with 'best fit' solutions available at the touch of a button or three – even down to optimising an enclosure to be cut most economically from the standard size chip-board sheet!

Again one is struck by the 'belt and braces' flexibility, enabling the engineer to adopt almost any starting point and operate under almost any preconditioned constraints. The various programmes overlap in a number of areas so the designer can focus in on drive unit, crossover or enclosure specifics after defining the main parameters.

A modelling program for optimising low frequency enclosure/driver alignment is particularly clever. Its starting point is just about the most complex box enclosure that one can envisage – a triple coupled cavity with internal driver, two boxes and three ports (shades of Dr Fryer's work on anti-noise). But by sending some of the dimensions off to infinity and reducing others to near zero the engineer can effectively simplify the program down to the various more common and practical solutions.

The model analyses sound pressure levels and the impedance at driver terminals, from input of such data as –3dB bass rolloff point, enclosure volume and driver sensitivity, and will produce specifications to match any polynomial filter rolloff shape (eg Butterworth, Bessel, etc). Comparison with earlier programs for simpler configurations and with experimental data has confirmed the veracity of this complex and flexible model.

A particularly useful side issue is the derivation of maximum cone excursion – a power handling constraint that is increasingly important with the high output low frequency signals from CD sources, and which can vary quite dramatically according to the choices made elsewhere. B&W tend to favour the sixth-order Butterworth bass alignment characteristic, as this minimises the excursion for maximum spl across the audio band. Their new 'computer optimised' Matrix 801 manages to deliver a full octave of extra bass extension over its predecessor despite using the same box size!

Another design 'sub-program' looks specifically at drive unit motors and magnets. To achieve a certain low frequency performance for a given box size and driver diameter implies a specific degree of electromagnetic 'shove' from the magnet and voice-coil. This itself is defined by a further range of parameters such as dimensions and flux of the magnet, pole pieces and top plate, number of turns and layers on the

voice coil, plus the physical tolerances needed to ensure good production yield and field reliability. Based on accepted electromagnetic theory along with the 'fiddle factors' needed to account for some of the greyer areas of magnetic leakage, these are all linked in the sub-program to the point where the BBC Micro will even generate the engineering drawings for the magnet metalwork, taking into account the commercially available ferrite magnet sizes stored in a database.

REDUCTIO AD INFINITUM

So much for the easy stuff! Now we get on to finite element analysis, which is the latest computer-based modelling system that B&W are now using to get even closer to grips with drive unit technology. Acquiring the velocimeter a decade ago was only half the solution. It provided a vital tool for the detailed analysis of existing drive unit diaphragms, and could show whether or not a deliberately modified experimental sample was producing results that were better or worse than a standard item. But deciding which modifications to try in pursuit of further improvement was still very much part of the black arts.

How does one predict the mechanical/acoustical effect of changing the alloy used in a metal dome tweeter? Or the shape of a bass/mid unit cone surround? Apart from crudely manipulating comparatively gross 'lumped parameters', suck it with the laser and see was the only viable approach until recently. Sophisticated high speed computers with sophisticated new programs are now providing new opportunities to model and define the finer detail of drive unit diaphragm behaviour. The complex surface of a dome or cone diaphragm can be modelled in the computer by defining a matrix of tiny 'finite elements' spread across the surface, each point with specified coordinates in space, and properties of mass, constraint and damping.

By the time the program is complete it should be possible to investigate a wide range of drive unit variations very rapidly by means of the theoretical model instead of the tediously slow, far more expensive and much more limited scope of physically prototyping. It will be possible to tailor drive unit characteristics to very precise requirements – or alternatively define the specific physical parameters of the material that will provide certain wanted characteristics. For every alloy or synthetic hydrocarbon that is prototyped today, the model will offer hundreds of alternatives; for every gemetric profile, thousands of variations.

So far the model works very well for an unterminated cone, and work is currently proceeding on adding the vital termination characteristics of the surround. At the same time the software package is being translated from the arcane machine code of the original computer specialist into something more accessible to the loudspeaker engineer. And the first fruits of

what is so far an only half complete project are found in the somewhat unconventional metal dome tweeters that are used in the new *Concept 90* and *Matrix 801* designs.

TOMORROW'S WORLDS

That just about wraps it up for the loudspeakers themselves, and the CAD techniques that are being used to probe deeper and deeper into the various elements thereof. But it's not the limit to B&W's research horizons by any means. The company has welcomed the arrival of the 'digital age' from the start, and is now starting to investigate the application of digital audio techniques to loudspeakers – specifically to take account of room interaction.

The transversal filter is a device that operates in the digital domain, and offers a range of time-domain capabilities denied analogue processing. To take an example, you have developed the 'perfect' loudspeaker that can reproduce a perfect impulse, at least in the anechoic chamber. But as soon as you place it in a room, its performance is mangled by the particular reflective/absorptive characteristics of that room and its specific site therein. The direct signal from speaker to ear fortunately remains unchanged, for this is the most important part, but the ear then suffers the (probably) unwanted reflections from nearby hard surfaces in the delayed sound.

A transversal filter should theoretically be able to cancel the room reflections – and any unwanted loudspeaker delayed resonances for that matter – by the follow-

Making mathematical models for finite element analysis.

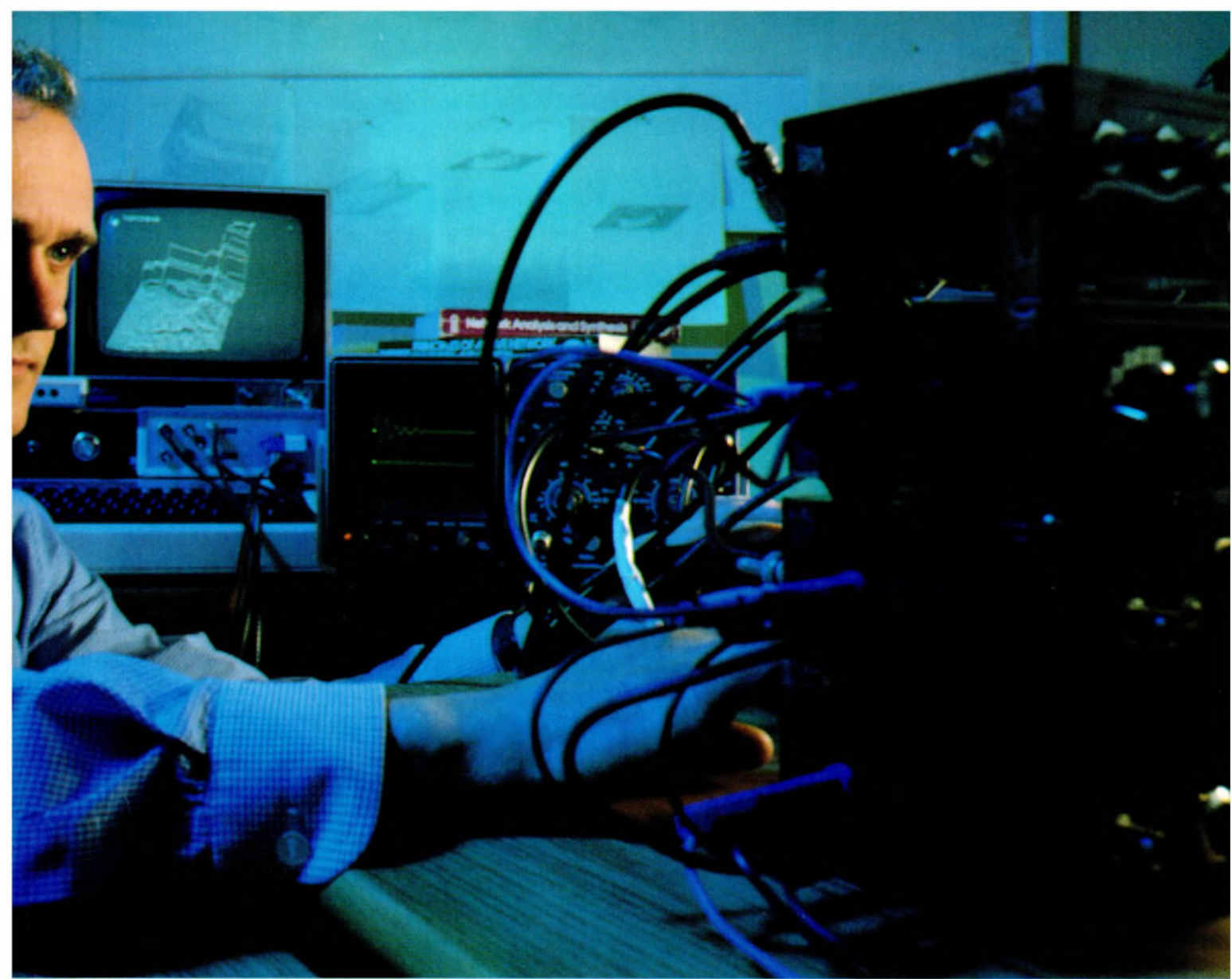


ing strategy. Since all the reflections are by definition delayed with respect to the main signal, it is possible to sort one from the other. An impulse signal would be detected at the listening position as the main signal followed by a succession of identifiable and discrete reflections (to the resolution of the measuring apparatus). The main signal could then be pre-processed in a digital pre-amplifier by adding the precise extra signal-derived components which will exactly cancel the unwanted reflections and delayed resonances. In other words,

you leave the main signal alone (apart from storing and delaying it fractionally), but add the inverse of the unwanted parts – mathematicians refer to convolving the characteristic, but this is a family magazine. Phase cancellation at the listener leaves just the original, clean and unadulterated signal.

To be fair, B&W haven't got that far yet. They're working on the building blocks at present, to find out exactly what can be done, and more important to discover what needs to be done. We probably need some





(Left) Peter Fryer and Steve Roe contemplate laser speckled interferometry pattern.
(Above) Dr. Peter Fryer, head of research.



of the room reflections for our own peace of mind – anyone who's spent a bit of time in an anechoic chamber will confirm the degree of disorientation and unease produced. But then again we could substitute the nasty characteristic of a given room with those of an ideal simulated one. The possibilities are tantalising.

Given that B&W can now construct theoretical prototypes, and can determine the detailed specification of a new design by punching a few buttons on a BBC Micro. Isn't there a risk of making the research

center redundant, its 'brains' distilled into the man-years of artful computer programs? I think not. Each advance peels another layer off the onion, and in so doing allows access to the layer underneath. One side effect of removing some of the more tedious mathematical chores of design will be to allow more time to be spent on corroborative listening.

One of Peter Fryer's fundamental tenets is that the subjective experience remains the bottom line. When research director at Wharfedale many years ago he was explor-

ing the subjective effects of adding known distortion components. He now has the tools to eliminate many of those distortions, but the task of maximising the subjective performance of a loudspeaker system at minimum cost to the consumer will remain forever a very subtle art.

Robert Trunz took over the B&W chairmanship in late 1987. Like John Bowers he is a music lover first and foremost, and brings youthful vigour, a worldly perspective and an exceedingly sharp intellect to the task of perpetuating the Bowers tradition of design and engineering excellence through pioneering research. Having turned down four offers for the company in as many weeks his commitment is clear. The model range is bang up to date, highly competitive and successfully diversifying to attract new markets (*eg Concept 90*). The research facility is the envy of rivals the world over. The only fly in the ointment would seem to be that the lifetime's work of one man is being penalised by the UK's iniquitous laws that discriminate so heavily against the private company.

It may take some time to appreciate our new CD player.

We'll forgive you if you take our new CD player for granted. We won't even fret if you forget its name (it's the Arcam Delta 70, by the way).

This unassuming box of tricks presents music in a natural, unforced manner. The marked absence of digital fatigue, even at very high volume, should also reduce a few aspirin bills.

As the first British company to be granted a full manufacturing licence, our designers and engineers were given carte blanche to create a better CD player. Applying the same principles and techniques that created our highly acclaimed amplifiers, they discovered that improvements could be made in the digital to analogue decoding system.

Like many of the better players, the Delta 70 uses single beam laser tracking, coupled with twin 16 bit Digital to Analogue Converters with fourfold oversampling. Unlike other players, however, our DACs feature a new improved master oscillator which, apart from having a glorious title, provides remarkable improvement in sound quality.

Not content with this, our designers have ensured that the audio stages are of a linear phase full class A design with no interstage coupling capacitors. They have also arranged the components on fibreglass printed circuit boards for maximum reliability.

The Arcam Delta 70, together with its matching amplifier, tuner and speakers forms the first complete British built compact disc system.

Here, at last, is hardware as reliable as the software itself. We would therefore recommend the acquisition of just one tool to maintain your investment.

A sturdy feather duster.

ARCAM

*audiophile products
from A&R Cambridge*

MARKET RESPONSE

Dealer Feedback – this exclusive market survey summarises dealers' opinions on the current state of the amplifier market in Britain, looking at factors such as consistency and reliability.

The run up to Christmas is the hi-fi industry's busiest time. Music reproduction comes into its own alongside muffins and mulled wine with all those long evenings and parties which beg for pleasant and loud sounds respectively. So it is hardly surprising that fewer dealers replied to our free-post questionnaire than we had hoped. And our back-up telephone canvassing was often met with a 'hoots-mon-I'm-busy-call-next-week' type of answer.

While difficult for us, of course, this is all very encouraging for the industry, and in the weeks before yule, when this survey was carried out, it was very hard to find a dealer that would admit the stock market crash was near to putting him out of business – although one Northern dealer claimed things had 'just died' on December 1st.

To obtain this month's results we sent out around 150 questionnaires on amplifiers, using the entirely random method derived from our computer printer's erratic selection of the mailing labels! The aim, as always, is to get as broad a reply base as possible in order to be representative.

The survey again complements the main review topic for the month, but concentrates on different criteria such as reliability or sound quality consistency in a brand. Whereas our reviewing methods look at an individual piece of equipment and can accurately assess its merits, this survey looks at broader considerations and is based on dealers' experience, comments and opinions. Dealers are, after all, the only people who see and hear their range of products day in and day out.

Reliability is perhaps the most important factor to the customer after sound quality. Sound consistency is a bit different because an amplifier in one room can sound different in another (through speakers of course). But dealers are trying amplifiers mostly in the same surroundings (i.e. their dem rooms or shops) and so we asked them for opinions based on recent experience of the trade.

We also asked dealers over the phone about possible 'tweaks' for

the amplifier: should it be sited on a table; should you leave the power on overnight; what is the best-selling speaker cable; and how do you keep an amplifier clean?

If you buy an amplifier today you will almost certainly be better off than if you had bought the same brand (other than the most esoteric) three or four years ago. According to dealers, components have all been improved over this period, with the result that reliability is much better than we expected.

Sound consistency is likewise affected by component improvements and by the better engineering standards achieved by the component industries that produce the parts. The other truism we elicited was that the Japanese seem to make the more reliable run of the mill type models. However, when these do blow up it is usually harder to get parts because importers don't always stock everything – which can mean waiting for parts from Japan. (The Japanese brands did not come out so well on our fast-and-slow repair time-chart!)

If you have the misfortune of having to wait for parts which are needed to mend your amplifier, Aston Audio for example offer the service of lending a shop amplifier for the period. This highly agreeable service in the face of adversity is probably worth checking out in view of a sometimes three or four month parts wait – but is the kind of service you would only get from a specialist independent retailer.

RELIABILITY

As mentioned above, amplifiers are a lot more reliable than we expected. When switched on for the first time or in their early life (when most faults occur), only 2.93 per cent had to be returned to the manufacturer as faulty. Considering the circuitry involved, not to mention the attitude of some delivery men, this speaks well of quality controllers at both the component and the final product manufacturers.

Because of the complexity of electronics, compared say to turntables, it was difficult to ascertain any particular Achilles

heel, and there were too few faults in 'our' dealers' ken to be able to spotlight one area.

Across the board three manufacturers stood out where reliability is concerned; these were Quad (48 points), Naim (43 points) and A&R (with 19 points). Very few manufacturers did not get a favourable mention, however so there were plaudits for everybody. And of the three leaders, both Quad and A&R were also mentioned once for unreliability.

Where unreliability was concerned a clear market leader (or straggler) was Cambridge Audio who, although stocked by relatively few dealers excited comments such as: "we're sending back 50 per cent", or: "I had six in and each one had a fault, but all the faults were different!" Exasperated dealers admitted that when you can get a Cambridge to work it often sounds better than anything else for the price, but you pay for this where reliability is concerned. Angela Curtis for Cambridge said that as far as she knew the firm were getting very few amplifiers back: "We did have a batch go wrong in October," she said, "and we have had problems with the launch of the CD2 CD player, but compared with our output we have had very few back."

Closely following Cambridge for unreliability were Musical Fidelity and Mission. Musical Fidelity were criticised for making amplifiers that get so hot the plastic knobs melt – one dealer recommended leaving it in the dining room to double as a hotplate. However, Mission were said by several dealers to have improved recently.

When your amplifier does go wrong (for whatever reason) we found that you can get it back in just under a week if you take it to your dealer and he has the parts. There were dealers who promised 'same day' 24 hour repairs, but these were less common than we found in our other surveys, presumably because the technology is so involved and most use a specialist local engineer. If the errant sample has to be sent back to its maker, this takes an average of 2.78 weeks. (In other words, if you take it in on Monday

morning you can just about get it back before closing time on Saturday three weeks later!)

For getting parts to dealers or turning equipment round quickly, some manufacturers were more praiseworthy than others. The fastest brand was cited as Mission, who generally replace products in a matter of two or three days according to dealers. The problem (as far as there is one) with Mission's philosophy is that customers distrust a total change when there may only be the most minor of problems – sort of using a bulldozer to build a sandcastle.

Other salient quick repair brands in order are Quad (less than a week) Naim, NAD, Rotel and Creek. Again many manufacturers were mentioned as being fast, and Mission, NAD and Rotel were mentioned once each for being slow. Where slow brands are concerned, Marantz came out worst with an average of ten weeks (although we did not include one frustrated reply of "years!" in our calculations). No others were singled out as especially slow.

CONSISTENCY

Sound consistency is difficult to assess because a piece of hi-fi equipment varies according to the other elements in the system, where you put it in a room, and characteristics of the room itself. So it does not follow that if you hear a friend's system sounding brilliant you are guaranteed the same sound if you buy a clone. (Try moving house!)

Dealers pointed out that they hear so much of their stocked brands every day it is difficult to gauge changes in sound over a longer period of time. Furthermore, dealers were not always notified about changes made by the manufacturer.

Whether a change is for good or ill, we wanted to know which amplifiers sound the same from batch to batch. Here Quad and Naim stood out head and shoulders above the rest, with Harman Kardon and Audiolab also receiving praise. The most inconsistent according to our survey were Mission, Musical Fidelity and then Creek, with A&R and Cambridge Audio also getting



The famous casual stance as the world knows and loves him.

ALPHASON, AUDIO TECHNICA, CAMBRIDGE AUDIO,
CANTON, COUNTERPOINT, D.N.M., EPOS, GOODMAN,
HARMAN KARDON, HELIUS, KOETSU, MANTICORE,
MONITOR AUDIO, MYST, MORDAUNT-SHORT, NAGAOKA,
NAKAMICHI, ONIX, ORANGE AUDIO, ORTOFON, P.S. AUDIO,
REGA, ROKSAN, ROYD, S.M.E. NAIM, SUPLEX, VAN DEN HUL,
WHARFEDALE, YAMAHA,

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some flak. It should however be noted that Mission was also praised by three dealers for consistency of sound, while Audiolab was denigrated by another couple for inconsistency.

TURNED ON

Just over half the dealers we asked said they would leave an amplifier on all the time for a better sound. "It keeps the capacitors charged up and makes everything run smoothly" was the sort of comment we heard. And this did not just apply to the pre-/power combinations owned by the sort of people featured in *Aspirations*. It seems that if you want to get the most out of your system you should run it warm the whole time.

All the dealers commented that an amplifier works better when warm, and gave periods from half to two hours as the necessary warm up time. "You can definitely notice the difference in sound," said many. Of course advising customers is a different matter, and responsible dealers also pointed out the fire hazard of leaving any electrical circuitry running overnight.

Some pre-amplifiers will take a trickle of current anyway as long as they are plugged into a socket (*ie* you never turn them off completely), and it was agreed that the pre- was more important than the power amplifier needed to be worn where the two are separate.

While admitting that there might be a better sound from a power amplifier after an hour or so warm-up, many said this was not essential and likened it to using a car from cold (which you can do without injury). Mr. Abbott of Abbott Audio said that constant power was especially important where valve amplifiers were concerned: "it prolongs the life of the valve by avoiding the harmful effect of current surge when switching on."

WHISKY AND DUSTERS

Colin MacKenzie of Hi-Fi Corner in Edinburgh says cleaning ladies are among the hi-fi system's worst enemies: "They dust around the amplifier and accidentally turn the volume up full; you come in, switch on and zap, it blows up!" Mr

MacKenzie therefore lists a locked door as one of the most important tweaks for an amplifier. He also complained that Scots spend much of the festive season pouring whisky and lager over their amplifiers, which makes the engineers' work doubly difficult. These comments are noted as the Western world plunges yet again into the winter solstice, but are repeated for the benefit of any stragglers.

Several dealers mentioned that a better method than dusting was to use a cleaning agent to keep the phono sockets clean and conductive. Audio Technica make a spray (the £6.25 *AT 6024*) which includes a dummy phono plug to clean the sockets, but this may require continual use every two or so months, and it is perhaps easier just to pull the plugs in and out of their sockets a few times to keep them clean.

STILL STANDING

Well over half (somewhere near 65 per cent) of the interviewed dealers said amplifiers benefit from a good table, stand or shelf. So why? You can imagine how resonance and stability affects speakers or a turntable but an amplifier surely sounds the same wherever it is? The answer was often religiously referred to as 'magic'. "It's magic and scientists can't explain it," we were told triumphantly.

Whether it is the magic of improved sound or the magic of improved bank balances after selling specially made isolation tables, we could only find two dealers who said amplifiers sounded as good on the floor (though quite a few said the sound difference was only slight).

One dealer said amplifiers should not be put on the same surface as the rest of the hi-fi equipment because of the adverse effect on overall sound. "We can hear the difference because we're in the shop all day listening to it, but nobody believes us when we tell them," he said. Perhaps more important is where the pre- and power elements (if you have them) of your amplification system should stand. With again a couple of dissenters, dealers said: "as far apart as the

interconnecting cable lets them." This is to avoid interaction between the units which sometimes causes audible humming and buzzing. (It was also mentioned that this should not happen if the units were properly made in the first place.)

WIRED FOR SOUND

The amplifier may be the heart of the system, but like all vital organs it does rely on everything else for peak performance. Speaker cable is something which is still considered the domain of the tweak freaks, and dealers told us that customers still couldn't quite get the hang of the idea that proper cable was better than any old flex or wire. Speaker cable, like everything else, comes in all shapes and prices, so we asked dealers to nominate their best sellers. QED 79 *strand* speaker cable is the most popular at present, and comes at a popular price of around 80 pence a metre. Dealers also gave Naim and van den Hul cable their votes, and Mission and Monster cable were mentioned as being popular among (dare one call them?) cablists.

THE RESULTS

Our survey gave dealers four price ranges for their top selling amplifiers, and we asked for their top three models in each. The points system is calculated on 5 for the top seller, 4 for the second and three for the third.

'Budget', below £150

- | | |
|-----------------------------|----|
| 1) A&R <i>Arcam Alpha</i> | 47 |
| 2) Denon <i>FMA 250</i> | 45 |
| 3) Mission <i>Cyrus One</i> | 44 |
| 4) NAD <i>3130</i> | 42 |
| 5) Rotel <i>RA 820</i> | 34 |

Mid Price £151-£300

- | | |
|-------------------------------|----|
| 1) Mission <i>Cyrus Two</i> | 35 |
| 2) A&R <i>A60</i> | 32 |
| 3) Naim <i>NAIT</i> | 31 |
| 4) Marantz <i>PM 45</i> | 18 |
| 5) Musical Fidelity <i>AI</i> | 16 |

Integrated and separates £300-£1,000

- | | |
|------------------------------|----|
| 1) Quad <i>34/306</i> | 46 |
| 2) Naim <i>62/Naim 140</i> | 38 |
| 3) Audiolab <i>8000A</i> | 28 |
| 4) Inca Tech <i>Claymore</i> | 24 |
| 5) Linn <i>LK1/LK2</i> | 21 |

£1,000 plus separates

- | | |
|---------------------------------------|----|
| 1) Acoustic Research <i>SP9/Krell</i> | 18 |
| <i>RSA 50 II</i> | |

- | | |
|------------------------------------|----|
| 2) Naim <i>32.5/HICAP/NAP 250</i> | 17 |
| 3) DNM <i>series 3/Gem</i> | 15 |
| 4) Musical Fidelity <i>MVT/270</i> | 15 |
| 5) Naim <i>32/HICAP/135 (x2)</i> | 14 |

Naim combinations were by far the most popular overall, but because there are so many combination variations to choose from they didn't sweep the board entirely. There were also some other variations that were good sellers with several dealers, namely PS Audio's 4.5 pre- and the Counterpoint *CSA12*, or a Nuance pre- with an Albarry power amp.

The results of this survey are representative of the comments from 33 dealers around the country. We don't pretend that this is the complete situation, or that our top sellers list is a necessarily true picture. The survey is a poll, and only as accurate as the limited size of the sample.

PARTICIPATING DEALERS

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

Abbot Audio, Kneesall, Notts.
 Absolute Sound and Video, Bristol, Avon.
 Active Audio, Derby, Derbyshire.
 Aerco Ltd, Woking, Surrey.
 A. Panthorpe Ltd, Hull, Humberside.
 Analog Audio, North Finchley, London.
 Aston Audio, Alderley Edge, Cheshire.
 Audio Projects, Leeds, W. Yorks.
 Brentwood Music Centre, Brentwood, Essex.
 Bryants Hi-Fi, Aldershot, Hants.
 Cambridge Hi-Fi, Chesterton, Cambs.
 Chichester Hi-Fi, W. Sussex.
 Covent Garden Records, London.
 Elite Hi-Fi, Harrogate, Yorks.
 Gilson Audio, Middlesborough, Cleveland.
 Grahams Hi-Fi Ltd, Pentonville Rd, London N1.
 Hi-Fi Corner, Edinburgh/Glasgow.
 Jeffries Hi-Fi, Eastbourne, E. Sussex.
 Lyon Audio, Stanway, Colchester, Essex.
 Moorgate Acoustics Ltd, Rotherham, Yorks.
 Norman Audio, Preston, Lancs.
 O'Brien Hi-Fi Wimbledon, London.
 Pinewood Audio, Andover, Hants.
 RPM, Clapham, London.
 Steve Boxshall Audio, Cambridge.
 The Audio Centre, Portadown, N. Ireland.
 The Audio File, Bishops Stortford, Herts.
 The Cornflake Shop, Windmill St, London W1.
 The Music Room, Glasgow.
 The Sound Organisation, York, Yorkshire.
 Tru-Fi, Aldershot, Hants.
 Truro Hi-Fi, Cornwall.
 West Midlands Audio, Worcester.



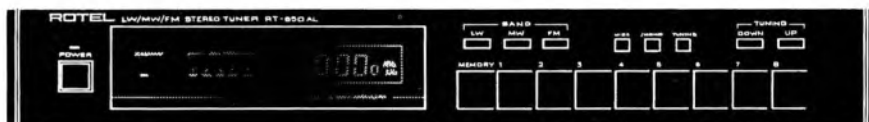
RC850 STEREO CONTROL AMPLIFIER



RB850 50W STEREO POWER AMPLIFIER

The connoisseur's choice. Incorporating much of the UK technology of the famous "BX" series amplifiers: Large well engineered power supplies ● High current capability ● Selected close tolerance high quality components ● Low noise integrated circuits ● Dual mono construction of the power amplifier ● Direct speaker wiring ● No degrading protection circuitry ● High quality phono stages ● Direct signal paths.

Technical features which combine to give music a sense of weight and effortlessness that smaller amplifiers can only aspire to. The twin box construction offers enormous flexibility in system building and the ability to run two power amplifiers either in bridged mode (150W per ch.) or to B1-amp loudspeakers. Higher power requirements can be achieved with Rotel's new RB870BX 100W and RB890 160W power amplifiers which are also bridgeable to provide 300W or 480W per ch. respectively.



RT850AL LW.MW.FM STEREO TUNER

The definitive tuner is its class. UK designed to provide very high standards of radio performance and music quality with the convenience of push button tuning and 16 preset stations. Winner of the "Best Buy" Award from Hi-Fi Choice and now winner of What Hi-Fi?'s prestigious Award for Best Tuner of 1988, the RT850L has now been restyled to match Rotel's new appearance design and also now features LED station indicators. Also available is the more affordable RT830AL Analogue Tuner, offering the same performance.



RCD820BX2 DIGITAL STEREO COMPACT DISC PLAYER

The very latest 16 bit 4 times oversampling technology combine with Rotel's own UK product development expertise to provide a C.D. signal source of fine resolution, definition and musical performance. With full numeric remote control, programming and full feature display the RCD820BX2 offers fine value. This special "BX" version incorporates additional UK designed circuitry and separate regulated power supplies effectively removing the digital hash from the audio circuits resulting in a cleaner audio signal with much improved dynamics and definition.

These fine components are but a small selection from Rotel's award winning range of real Hi-Fi products which offer very high standards of technical performance and musical enjoyment. All are based upon Rotel's UK balanced design concept which ensures that within the resources available, each aspect of the products design has been optimised. To find out why Rotel has now received What Hi-Fi?'s prestigious awards for 1988 for Best Turntable, Best Radio Tuner, Best Loudspeaker and Best Hi-Fi System (amplifier - Tuner - C.D. Player - Loudspeakers) call Rotel for details of your nearest dealer.

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AND



CHOOSING AND USING . . . AMPLIFIERS

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

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

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

heresy at the time, but the trend is now firmly established, and even some of the Japanese manufacturers have since followed suit.

TWO MARKETS

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

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

PRE-AMPLIFICATION

As hi-fi amplifiers become increasingly minimalist, the pre-amp now only retains two key functions: the sorting out of the signals from the vinyl disc source, and the switching of the various inputs and outputs. Tuners, cassette decks, CD players, and what-have-you all put out more or less the same sort of signal, which is already equalised to 'flat'. Vinyl disc apart, the pre-amp then becomes little more than a glorified switch with volume and balance controls.

Vinyl disc replay is quite a different kettle of fish. The pre-amp is connected directly to the transducer itself, with no intervening electronics, and this introduces all sorts of difficulties. Furthermore, the signal from the cartridge is very small, and requires two distinct stages of equalisation to get a 'flat' end result. To add insult to injury, there are now two popular kinds of cartridge, the high(?) output moving magnet and low

output moving-coil (plus a few odd permutations), and they are different enough to need quite separate treatment. There's not even a standard for the source or input impedance of low-output cartridges.

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

POWER AMPLIFIERS

This is the part of the amplifier whose job it is to drive the loudspeakers – and a right old job that can turn out to be. Like the cartridge, a loudspeaker is a transducer, and the task is to turn the electrical model of the music signal back into a mechanical (acoustical) signal for the benefit of the ears. The loudspeaker is a form of motor, but its task of covering the whole range of audio frequencies is mechanically almost intolerable, and there is an inevitable lack of control at various resonance points. While the amplifier provides the loudspeaker with a voltage which corresponds to the amplified music signal, it is the characteristics of the loudspeaker itself which determines the current demand. This current demand can be very unpredictable, particularly at resonance points, which is why serious hi-fi amplifiers are usually designed with plenty of surplus current capacity, and

with an eye on the stability of the voltage signal whatever the current demand.

The main measurements on amplifiers relate to power output and distortion. Power is normally expressed in Watts, but we translate this into a measure of relative loudness, the dBW, which is far more meaningful. More important than the maximum power output itself is the way the power is maintained into different loads, and this is analysed in the reviews. The various distortion measurements also help explore the limits of the amplifier, but paradoxically, striving for very low distortion seems to prejudice sound quality.

CHOOSING

There are a number of criteria one could use when selecting an amplifier, and the most valid is probably sound quality. Despite the attention it attracts, power output comes much further down the list, because the differences between most models is not in fact that great, and measured power is by no means a reliable indicator of subjective loudness capability. At the top end of the market, upgrading is less likely to involve an increase in power than improvements in sound quality gained through changes in power supplies for pre- and power amplifiers.

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

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



RA820A INTEGRATED STEREO AMPLIFIER

Latest in the famous 820 series amplifiers from Rotel, offering dynamic power far in excess of its conservative 30 watt rating. The RA820A has benefited substantially from Rotel's UK product development programme with significant improvements to sound quality, useful features and improved appearance design to match Rotel's new product line. First choice for many on the road to serious sound reproduction.



RT830AL LW.MW.FM. STEREO TUNER

The thinking man's affordable tuner, where its modest looks and operating simplicity belie the sophisticated circuitry employed to produce an unusually open and musical sound. In its latest guise, the new appearance design RT830AL takes over from the critically acclaimed RT830L. Also available is the RT850AL offering digital tuning with 16 preset stations.



RCD820B DIGITAL STEREO COMPACT DISC PLAYER

The very latest 16 bit 4 times oversampling technology combine with Rotel's own UK product development expertise to provide a C.D. signal source of fine resolution, definition and musical performance. With full numeric remote control, programming and full feature display the RCD820B offers fine value and is easy to use. For the more adventurous the RCD820BX2 provides the music lover and enthusiast alike, with stunning performance whilst remaining eminently affordable.

RL850/II LOUDSPEAKERS

These modestly sized loudspeakers offer an unusually high musical performance for their cost. In its latest form, the RL850/II benefits from an improved tweeter and crossover which have further refined its performance. With black ash finish and complete with black cloth grills (shown here without grills) they blend into any room environment. Possibly the most acclaimed loudspeaker in the UK today. (Recipient of Hi-Fi Choice's Best Buy Award for the last four years, as part of Rotel's Best system Award from What Hi-Fi? for the past four years, and now winner of What Hi-Fi?'s prestigious award for Best Loudspeaker of the Year for 1988.)



These fine components are but a small selection from Rotel's award winning range of real Hi-Fi products which offer very high standards of technical performance and musical enjoyment. All are based upon Rotel's UK balanced design concept which ensures that within the resources available, each aspect of the products design has been optimised. To find out why Rotel has now received What Hi-Fi?'s prestigious awards for 1988 for Best Turntable, Best Radio Tuner, Best Loudspeaker and Best Hi-Fi System (amplifier - Tuner - C.D. Player - Loudspeakers) call Rotel for details of your nearest dealer.

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RECOMMENDED



Though rumoured to carry a 'Plus' suffix, there was no sign of such designation upon either the amplifier or its carton, though a number of changes have been made over the original *Alpha* which was first introduced three years ago. The 1987 sample was in an all black finish, emphasised rather effectively in pale blue legends and highlights. We carried out full re-auditioning and updated the measurements where necessary, most of the changes relating to the power supply and detail component selection for enhancing sound quality.

The *Alpha* shows a slight but worthwhile increase in power over its predecessor, maintaining its good load tolerance and power bandwidth, and with a significant increase in peak current capability.

A compact integrated design, *Alpha* is distinguished by a good finish and appearance which result from A&R's professional view of engineering design. The five inputs include moving magnet disc, and the well-laid out controls incorporate bass and treble. Ergonomically, however, the five identical knobs do not make for the easiest, most instinctive operation.

Output power is 30W per channel, with an output stage rated to take account of some of the more difficult loudspeaker loads. The disc input comes with a standard 47kohms/100pF characteristic, but additional loading may be retro-fitted with options down to 8kohms and up to 420pF.

The price is modest but A&R have not skimped on quality details, such as the custom silver-plated 4mm speaker cable sockets, which provide 'direct' and headphone-switched options. All inputs are the usual RCA phono jacks, with the headphone outlet a standard 1/4in socket on the front panel.

LAB REPORT

Inside, the construction quality is exemplary. The unit is built on a single board with clean, simple signal paths and optimised 'star' grounding. Internal wiring is virtually non-existent. The output stage is complementary bipolar direct coupled, and the earlier stages use high quality (and improved) integrated

circuits. Coupling components have been reduced to a minimum in order to maximise sound quality and some top grade polypropylene capacitors have even been included.

Attaining a comfortable 101dBA maximum loudness on test, the peak 8ohm power delivery reached 17dBW (50W) and rated power was comfortably achieved into 2ohms on peaks. Power bandwidth was fine with a healthy peak current averaging 9A.

Distortion levels were moderate, particularly with respect to high frequency intermodulation. Noise levels were fine, with the DC offsets satisfactorily low. Input overload margins were ample and the stereo channel separation results were rather better than average. Power supply modulation was respectable for the type, while all other aspects conformed to a well balanced competent design.

SOUND QUALITY

Rating a solid above average, the *Alpha* continues to maintain its competitiveness on sound quality. Unanimously described as 'nice sounding', this is both praise and criticism, but more than most it should fit unobtrusively into almost any system context. The sound was a little 'small', somewhat 'softened' and lacking a little speed, 'sparkle' and transparency. But it was also refreshingly free of 'hi-fi-ish' qualities in the perjorative sense, staying well under control and giving good musical involvement.

CONCLUSIONS

Comfortably continuing to merit recommendation, the *Alpha* is a fine and essentially musical allrounder, with sound lab performance, sensible facilities, fine build quality and attractive presentation. Though it showed some sonic limitations in the context of the very highest quality ancillaries, the overall balance has been very well judged to make the most of the lesser components its price indicates will be likely partners.

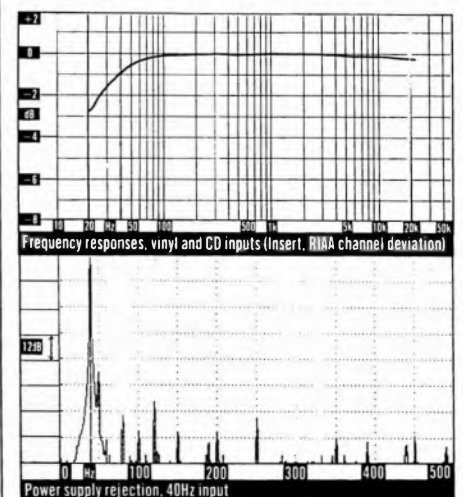
Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

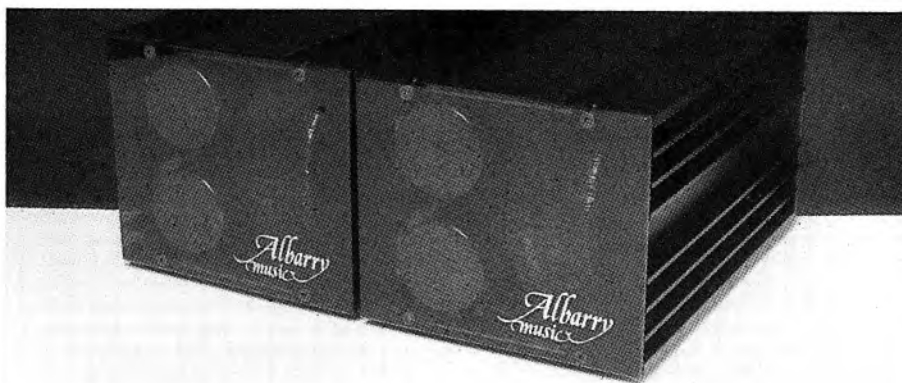
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	20Hz	30W (= 15dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.4dBW	16.8dBW	16.8dBW
Both channels, 4ohm load	13.1dBW	14.1dBW	14.1dBW
One channel, 2ohms, pulsed	-dBW	14.9dBW	-dBW
Instantaneous peak current		+13A	-12.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	-73.7dB	-73.1dB	-66.2dB
Intermodulation, 19/20kHz, rated power, aux input			-77.9dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			-73.7dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-73.0dB
Aux/CD input (1HF, CCIR weighted)			-76.9dB
Residual, unweighted (volume control at min)			-78.9dB
DC output offset		left -8mV, right +6mV	
DC offset, pre-amp		left n/a, mV, right n/a mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	27.0dB	27.1dB	27.6dB
Disc (mc) input (1HF)	n/a dB	n/a dB	n/a dB
Aux/CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	68.2dB	71.8dB	56.3dB
Aux input	69.2dB	70.3dB	64.3dB
Output impedance (damp)	0.27ohm	0.27ohm	0.33ohm
Channel balance, disc, at 1kHz			1dB
Volume/balance tracking			
Aux input	0dB	-20dB	-60dB
	0.06dB	1.05dB	1.07dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.42mV	46kohms 110pF
Disc (mc) input	n/a	n/a mV	n/a kohms n/a nF
Aux input	Phono	36.0mV	23.0kohms 36pF
Power amp	n/a	n/a mV	n/a kohms n/a pF
Output, pre-amp (tape)			10.0V max, 180ohms
Disc equalisation error, 30Hz-15kHz			+0dB, -1.5dB
Size (width, height, depth)			40x8x22cm
Typical price inc VAT			£150

Reassessed



ALBARRY M408 SERIES II

PRESENCE AUDIO, THE OLD POST HOUSE, PLUMMERS PLAIN, HORSHAM, W. SUSSEX. TEL: (0403) 76777.



The Albarry *M408* power amplifier is a modestly (40W) rated monoblock design with interesting styling and excellent finish. Now in *series II* form, the design criteria remain the same as before, specifically to drive moving-coil loudspeakers and provide adequate current capability for low impedance loads.

The case is based on two large extruded aluminium heat sinks, finished in black, which form the side structures. Alloy panels separate these two and are overlaid by transparent perspex covers which are tinted deep red. The front panel is engraved red perspex, back-lit by LEDs, and some of the internals can be distinguished through it, adding interest in a world of satin black standardisation. The back carries two enormous binding posts, a fuse, a trip reset button, an on/off switch, and a phone line input socket.

The case is filled by a large ILP 300VA toroidal transformer and two computer grade electrolytic smoothing capacitors, the common terminals of which are connected by a copper bar. The amplifier board is small and neat, and the general level of construction good. Comprising discrete components with a class B Darlington output stage using high power *TIP 141/146*, the protection circuit relies on output current monitoring with an infra red coupled trip.

LAB REPORT

The Albarry easily achieved its specification into 8ohm and power was well maintained with lower impedances on both pulsed and static tests. The peak current capability was generous for the specified power output, but protection circuits were activated by the 2ohm pulse test.

The harmonic distortion figures were commendable at all powers below clip, and intermodulation products of the 19/20kHz tones were well suppressed. The signal-to-noise ratios were excellent but the 5kohms input impedance is rather low. Input sensitivity was standard and the bandwidth extended wide with a very flat frequency response. The supply modulation test confirmed the high quality of the power supply.

SOUND QUALITY

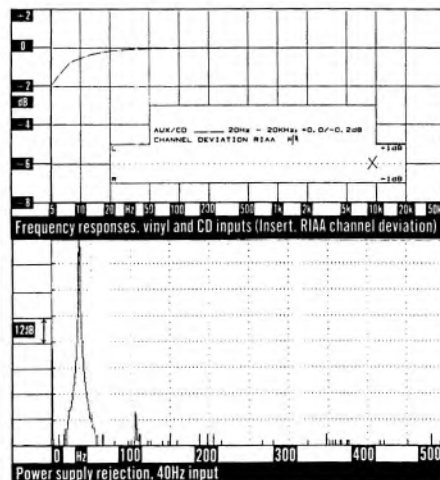
Rumours that sound quality had been improved turned out to have been well founded, the *408 II* rating 20 per cent higher than a sample we tried a year or two ago. The soundstage was presented with good clarity and dynamics, and well above average stage width. The presentable depth impression was accompanied by strong, stable focus. The front stage was a trifle 'forward' and 'present', but without excessive midrange hardness or brittleness. If anything the mid character tended to richness, with some mild 'thickening' added to the lower midrange. The treble sounded slightly emphasised – rather explicit, yet focused and informative despite a touch of electronic 'grain' and 'edge'. Good articulation with a decent level of power and extension was evident in the bass. Adverse loadings were handled well, and it played louder than the test power ratings might suggest.

CONCLUSIONS

Albarry's latest *408 II* monoblocks returned a performance rather above the industry average on both lab and listening tests. They have yet to achieve star quality, but constitute an attractive pair of nicely finished units which are worthy of recommendation. Make sure that the low input impedance will not embarrass your preamplifier, and also check out the larger *1008 II* monoblocks that provide 100W per channel.

TEST RESULTS

Power output		Monoblok power amplifier		
Rated power into 8ohms, maker's spec		40W (= 16dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	17.1dBW	17.2dBW	17.2dBW	
Both channels, 4ohm load	16.2dBW	16.6dBW	16.5dBW	
One channel, 2ohms, pulsed	-dBW	15.5dBW	-dBW	
Instantaneous peak current	+22A	-22A		
Distortion				
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz	
	-74dB	-74dB	-68dB	
Intermodulation, 19/20kHz, rated power, aux input	-83dB			
Noise				
Residual, unweighted (volume control at min)	-95dB			
DC output offset	left -0mV, right +0mV			
Input data				
Power amp	socket type	sensitivity	loading	
		81mV	5.2kohms	n/a pF
Typical price inc VAT				£595 pair



AUDIOLAB 8000A

CAMBRIDGE SYSTEMS TECH. LTD., 26 ROMAN WAY, GODMANCHESTER, HUNTINGDON, CAMBS PE18 9LN. TEL: (0480) 52521.

BEST BUY



Now a well established model, the 8000A underwent extensive sound quality revisions for 1987, through subtle development and refinement. It is conservatively rated at 50W per channel.

In contrast to much UK equipment today, which is of 'straight line' design, the Audiolab does have tone controls: however these are said to be specifically designed to have a negligible effect on sound quality. Comprehensively equipped, the input facilities are all phono, and include disc (mm and mc), tape 1 and 2, plus tuner and CD/aux. A proper 'record out' selector matches the input selector. A headphone socket is provided, which mutes the two sets of speaker outputs *via* a high-quality relay. A small dealer modification provides for separate pre/power amp use if this is required by the user, but in this mode the circuitry which prevents switch-on thumps from the pre-amp will not operate.

As well engineered internally as it is finished externally, the amplifier uses a large 250VA toroidal transformer specially mounted to reduce mechanical hum. The output stages are high-current, direct-coupled complementary, with a DC servo to rolloff the extreme subsonic response without need for the usual decoupling capacitor in the feedback loop. Full electronic protection is designed to allow adverse load drive. All discrete circuitry is employed. The mc headamp is a particularly careful design, and in fact many of the design features are more commonly associated with more costly models.

LAB REPORT

Specified at 50W (17dBW) the amplifier demonstrated a fine power bandwidth at 19dBW into 8ohms. The 40hm continuous delivery was also pretty good, while its $\pm 28A$ peak current capability was more than sufficient for the rated power. Peak level approached 100W per channel (19.8dBW) holding well into 4ohms at 18.6dB and still very strong at 18dBW, 2ohms.

Harmonic and particularly intermodulation distortions were at negligible levels, in a sense showing that high-linearity circuits are not in themselves a barrier to good sound

quality. Noise levels were fine, and the DC output offsets negligible. Input overload levels were ample, and stereo separation up with the best, bar the special double-mono amplifier types. Output impedance was low and channel balance very accurate, except at the lowest volume settings. Input sensitivities were sufficient for all classes of source, and the input characteristics can be changed *via* optional loading plugs. RIAA equalisation followed the IEC rolloff, hence the subsonic fall shown here, while the tone controls were suitably mild in action. The pre-amp output also offered a decent level at low impedance for other power amplifiers. Subjectively, no change in sound quality could be heard with the tone controls engaged.

SOUND QUALITY

This amplifier surprised all those who heard it. On moving coil input the overall subjective rating was 'good plus' which is ahead of the competition. Its character was highly neutral, if very slightly 'clinical', with an open, wide frequency range and very presentable bass, the latter offering power, precision and extension. The midband was well defined, articulate and well-focused while the stereo image showed decent depth and ambience.

A marginal improvement of depth was noticed *via* moving magnet input, while the treble remained slightly imperfect; here a hint of 'fuzziness' and 'grain' was a little sweeter than on moving-coil, with some further advance in treble quality and a touch more clarity.

The sound *via* aux was dominated by a fine transparency and with additional, admittedly minor, improvements in stereo staging, depth, bass power and detail. It could get pretty loud, and sounded very tolerable into clipping, with 103dBa possible into the normal loudspeaker. A fine load tolerance was also evidenced by the 102dBa produced into the severe load.

CONCLUSIONS

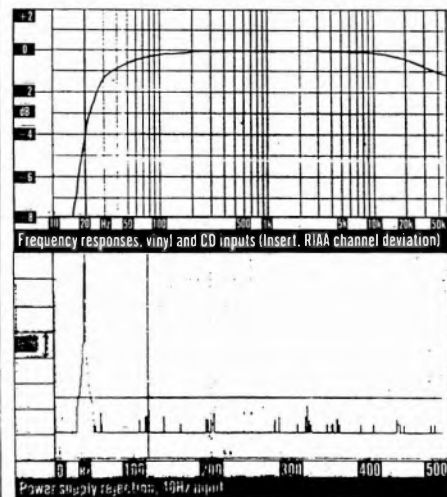
In '87, Audiolab further enhanced the sound quality, by subtle improvements to the interior circuitry, so fully maintaining the

model's keen competition. The 8000A is a fine integrated amplifier of very good power delivery with excellent finish and build quality. The tone controls do not detract from the performance, while its load tolerance is exceptional. A highly versatile model, this superior quality design remains a Best Buy.

TEST RESULTS

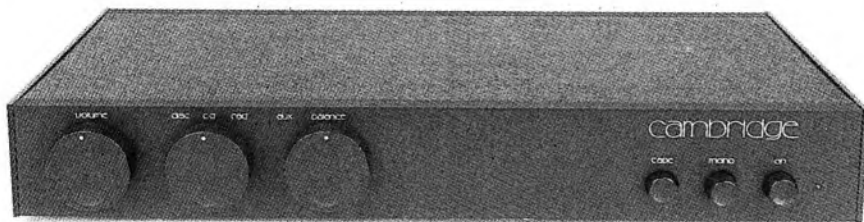
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		50W (= 17dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.4dBW	19.5dBW	19.0dBW
Both channels, 4ohm load	17.2dBW	17.6dBW	17.0dBW
One channel, 2ohms, pulsed	17.8dBW	18.0dBW	17.3dBW
Instantaneous peak current		+27A	-28A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CO in.	-90dB	-95dB	-80dB
Intermodulation, 19/20kHz, rated power, aux input			-85dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-85dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-80dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-78dB
Disc (mc) input (1HF, CCIR weighted)			-73dB
Aux/CO input (1HF, CCIR weighted)			-82dB
Residual, unweighted (volume control at min)			-78dB
DC output offset			left 2mV, right 3mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	29dB	30dB	30dB
Disc (mc) input (1HF)*	26dB	26dB	26dB
Aux/CO input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	-90dB	-72dB	-50dB
Aux/CO input	-78dB	-77dB	-56dB
Output impedance (damp)	0.03ohm	0.04ohm	0.12ohm
Channel balance, disc, at 1kHz			0.04dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CO input	0.04dB	0.0dB	3.6dB
Input data			
Disc (mm) input	socket type	sensitivity	loading
Disc (mm) input	Phono	0.3mV	47kohms 35pF
Disc (mc) input*	Phono	0.007mV	100ohms 4.7nF
Aux/CO input	Phono	12mV	20kohms 70pF
Output, pre-amp (tape)			7.7V max, 600ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB -2.2dB
Size (width, height, depth)			44.5x7.4x34cm
Typical price inc VAT			£325

*First reviewed: 1983. Retested 1987.



CAMBRIDGE AUDIO P40

CAMBRIDGE AUDIO SYSTEMS INTERNATIONAL, BURREL ROAD, ST. IVES IND. EST., CAMBS PE17 4LE. TEL: (0480) 496496.



Though the name stretches back nearly two decades, Cambridge Audio products have only been intermittently available, the company changing hands and lying dormant on occasion. Now owned by an engineer who was involved back in those early amplifier years and having conspicuous current success with a state-of-the-art CD player, after some hesitancy the amplifier range is beginning to re-establish itself too. Last year's *Integer* has evolved into a *P55*, at a slightly higher price and power rating than the £200 *P40* integrated amplifier reviewed here, itself reviving one of the names from Cambridge's past.

This being the 'eighties rather than the 'sixties, *P40* is now a simple 'straight line' design with minimal facilities to clutter the signal path. Housed in a simple slimline black enclosure, finish has been significantly improved over earlier Cambridge production and is now to a high standard, though one could still pick a nit or two over the 'feel' of the controls. There are just three large control knobs and three pushbuttons, the former for volume, balance and input selection, the latter for power on/off, mono/stereo and tape monitoring. The rear panel has a single row of phono plugs for interconnection, plus 4mm sockets for loudspeakers; between the disc inputs a switch selects the extra gain needed for moving-coil cartridges.

LAB REPORT

The *P40* has a particularly clean and direct layout, construction being based on a single printed circuit board that has an 'audio quality' substrate. The output stage is quasi-complementary direct coupled bi-polar, and high quality ICs are used for the disc input. The passive line stage provides lower sensitivity on line inputs. A generous toroidal transformer with plenty of reservoir gives ample supply to the two channels; build quality is good, and high current fuse protected transistors are used.

The *P40* comfortably beat its rated 40W/16dBW, but the 3dBW loss when driving both channels into 4ohms is a little severe, indicative of the shared supply. Power bandwidth is very good, and peak current capability a fine $\pm 20A$, so there is plenty of reserve 'urge'. The power supply modulation test showed that

spurious were at a low level, but the background was a little 'dirty' in terms of the number of components generated at low level in the power supply.

Distortions were pretty good except at high frequencies where there was some significant deterioration: there was some question about high frequency stability when rigged up using short low inductance wiring in the lab, but this was not encountered during normal use with cables. The noise figures were reasonable except on the moving-coil input, where $-55dB$ is barely adequate and was gently audible. Stereo separation was reasonable enough, and overload margins adequate, if a little suspect at high frequencies on the moving-coil input. Sensitivities were a little lower than average, and volume/balance tracking could have been improved at low levels. The RIAA disc equalisation curve showed quite sharp bandwidth curtailment at low frequencies, $-20dB$ at 50Hz and $-7dB$ at 20Hz, but a smooth, neutral characteristic elsewhere.

SOUND QUALITY

Our first sample delivered only mono, but still sounded very promising nonetheless: its replacement rated good overall, a fine result for the price. Particularly impressive was the subjective 'speed' and 'grip', giving a fine impression of coherence and integration with excellent dynamics. There was some criticism of a treble 'untidiness', and a certain lack of sweetness here, with some sibilant emphasis, but the soundstage was open and clear with good transparency and reasonable depth portrayal. The quality improved with CD, suggesting that the power amplifier is more capable than the pre-amp section.

CONCLUSIONS

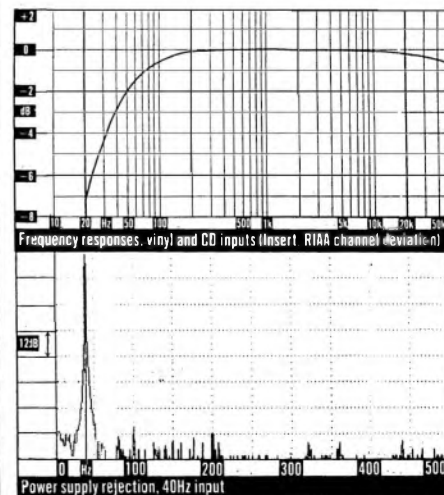
Subjectively one of the better integrated amplifiers around, the *P40* still shows room for improvement, particularly on the moving-coil disc input, but at least it has this option available, and produced a sound quality which justified the step-up in price from popular \$150 models, particularly for rock music listeners. The sample fault we encountered was clearly just that (late as usual,

they rushed us a sample diverted from an export batch, modifying it without proper checking!), and some caution should be taken avoiding exotic loudspeaker cables and/or very short runs, but the *P40* is clearly a welcome new Best Buy, even if it is still a little wet behind the ears.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		40W (= 16dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	17.5dBW 17.86dBW 17.65dBW		
Both channels, 4ohm load	14.5dBW 15.2dBW 14.9dBW		
One channel, 2ohms, pulsed	-dBW 15.5dBW -dBW		
Instantaneous peak current	+20.0A -20.0A		
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux input	-75.0dB -74.0dB -51.0dB		
Intermodulation, 19/20kHz, rated power, aux input	-75.0dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-71.0dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-63.0dB		
Noise			
Disc (mm) input (1HF, CCIR weighted)	-73.0dB		
Disc (mc) input (1HF, CCIR weighted)	-55.0dB		
Aux/CD input (1HF, CCIR weighted)	-75.0dB		
Residual, unweighted (volume control at min)	-78.0dB		
DC output offset	left 25mV, right 10mV		
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	31.0dB 30.0dB 30.0dB		
Disc (mc) input (1HF)	31.7dB 30.6dB 22.7dB		
Aux/CD input (1HF)	>20dB >20dB >20dB		
Stereo separation			
Disc input (mm)	67.0dB 67.0dB 50.0dB		
Aux input	76.0dB 72.0dB 50.0dB		
Output impedance (damp)	0.122ohm 0.116ohm 0.118ohm		
Channel balance, disc, at 1kHz	n/a dB		
Volume/balance tracking			
Aux input	0dB -20dB -60dB		
	0dB 0.7dB 5.0dB		
Input data			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.56mV	47kohms 115pF
Disc (mc) input*	n/a	0.062mV	47kohms 115pF
Aux input	Phono	42.5mV	7.0kohms 410pF
Output, pre-amp (tape)		10.25V max, 7.7kohms	
Disc equalisation error, 30Hz-15kHz		+0dB, -5dB	
Size (width, height, depth)		43.6x6.25x28.2cm	
Typical price inc VAT			£200

Reassessed



CREEK CAS 4140 SERIES 2

CREEK AUDIO SYSTEMS, 2 BELLEVUE ROAD, FRIERN BARNET, LONDON N11 3ES. TEL: 01-368 4425.

BEST BUY



This *Series 2* version of the *CAS4140* integrated amplifier is essentially a new design rather than just an upgrade. The £200 *4140* lacks the tone controls of the cheaper *4040* tested last year, but the styling is similar, and similarly individualistic.

The front panel carries a row of push button selector switches covering the normal phono, tuner, CD/aux and tape inputs, plus mono and mute. The other front panel facilities are volume and balance rotaries, a headphone socket and on/off switch. Loudspeakers are connected by 4mm sockets, with a choice of switched or unswitched outputs. Only phono sockets are now used for all inputs.

The disc input sensitivity may be matched to either moving magnet or moving-coil cartridges *via* internal switches. The thick aluminium U-shaped chassis also doubles as a heat sink to supplement the small finned back panel extrusion; unusually in these days of black metal, the cover is made of chipboard covered in black ash vinyl.

Internally the amplifier is constructed on a single printed circuit board, with the circuits laid out to facilitate short signal paths. The phono stage has low noise transistors followed by good quality integrated circuits around which RIAA equalisation is performed. A large 160VA toroidal transformer fills one end of the case, and the rectifier and smoothing capacitors are located on the PCB adjacent to the power amplifier. The power section itself is constructed from discrete components with high current *TIP35/36C* output transistors.

LAB REPORT

The rated output was easily achieved into an 8ohm load, giving a maximum of 17dBW. Overload protection limited power delivery into 4ohms, with both channels restricted to a lowly 9dBW. Although a reasonable 14.5dBW was recorded on the 2ohm pulsed test, only $\pm 4A$ was available on the peak current test before protection circuits operated.

Intermodulation performance was good on both line and moving magnet inputs, but was just adequate *via* moving-coil. DC offset was a little high but not too serious, and volume/balance tracking was acceptable. Stereo separation was reasonable on disc inputs but could benefit from some improvement on 'aux' – after all some CD players have better than 90dB separation at 1kHz. Input over-

load was good on 'aux', acceptable on moving magnet disc, if rather restricted on moving-coil. (This is currently being attended to, we understand.) Sensitivities (especially moving-coil) are on the low side, but loadings are well chosen.

Poorer than average 50Hz and related harmonic break-through was found on the supply mod test. The RIAA is accurate, with the amplifier designed to have a limited bandwidth which rolls off sensibly at the frequency extremes. The moving-coil response shown on the graph was altered by its restricted input overload margin – in reality, when not driven into clip, the response is the same as for moving magnet. Channel deviation meandered a little but stayed within reasonable limits nonetheless.

SOUND QUALITY

This improved Creek *4140* amplifier sounded different from its predecessors, reflecting the new generation nature of its design. The sound quality scores for both the analogue and the CD inputs were significantly lifted compared with earlier Creeks.

Strong central focus highlighted the main performers and provided a good level of clarity and detail *via* moving-coil. Sounding slightly filtered at the frequency extremes, this has the advantage of warding off spurious effects such as rumble or low bass boom, or fizz and other similar cartridge high frequency anomalies.

The bass was considered a little lightweight, but was tight and articulate, tuneful and agile, complementing a clear and precise treble with low distortion and good control. Stereo images presented well above average depth and ambience – a clear contrast to the original version.

The CD input produced a mild improvement. More bass extension was noted, and the crisp and well detailed sound is impressive for the price. The moving magnet disc input provided a small improvement over moving-coil, though the performance was pretty good on both cartridge inputs despite the m-c's modest measured overload margins.

CONCLUSIONS

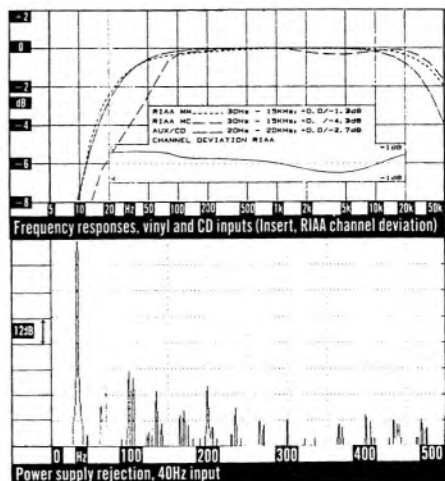
Creek's new *4140* achieves a level of performance which should satisfy both established Creek fans as well as earlier critics. The possibly over-cautious protection system indi-

cates preference for speakers with a kind impedance characteristic, and the m-c disc input could usefully trade some sensitivity for more overload margin, but the overall result represents good value.

Setting a new Creek standard for sound quality, it was neutral and well balanced, clear and well focused, remaining tidy and well controlled to the audio band extremes. As such the *4140* deserves a Best Buy rating, and provides a fitting partner for the fine *3140* tuner.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		40W (= 16dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	17.0dBW 17.5dBW 17.0dBW		
Both channels, 4ohm load	9dBW 9dBW 9dBW		
One channel, 2ohms, pulsed	-dBW 14.5dBW -dBW		
Instantaneous peak current	+4A -4A		
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux input	-65dB -65dB -46dB		
Intermodulation, 19/20kHz, rated power, aux input			-70dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-67dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-34dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-72dB
Disc (mc) input (1HF, CCIR weighted)			-79dB
Aux/CD input (1HF, CCIR weighted)			-84dB
Residual, unweighted (volume control at min)			-84dB
DC output offset		left 17mV, right 28mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	23.7dB 21.8dB 21.3dB		
Disc (mc) input (1HF)*	13dB 9dB 9dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	54dB 58dB 42dB		
Aux/CD input	56dB 56dB 42dB		
Output impedance (damp)	0.09ohm 0.08ohm 0.1ohm		
Channel balance, disc, at 1kHz			0dB
Volume/balance tracking			
Aux/CD input	0dB 0.12dB 0.26dB		-60dB 3.0dB
Input/Output			
	socket type	sensitivity	loading
Disc (mm) input		0.47mV 112kohms	200pF
Disc (mc) input*		0.032mV 1kohms	n/a nF
Aux/CD input		62mV 55kohms	80pF
Power amp		n/a mV	n/a kohms n/a pF
Output, pre-amp (tape)			8V max, 1kohms
Disc equalisation error, 30Hz-15kHz			+0dB, -1.3dB
Size (width, height, depth)			42x5.5x16.5cm
Typical price inc VAT			£200
*see text			





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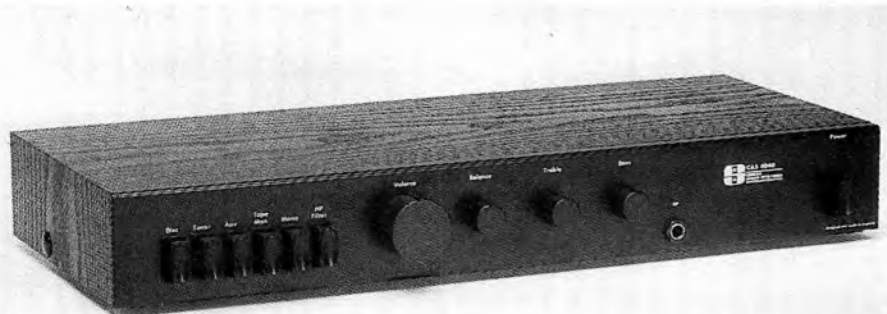
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A240 CD

CREEK 4040

CREEK AUDIO SYSTEMS, 2 BELLEVUE ROAD, FRIERN BARNET, LONDON N11 3ES. TEL: 01-368 4425.

RECOMMENDED



Fully re-auditioned and partly re-tested for 1987, Creek's UK-built budget amplifier is specified at 35W (15.5dBW) per channel, and while features are fairly basic, it does provide tone controls as well as a headphone socket, not to mention a black wooden sleeve. Loudspeaker connection is *via* 4mm socket/binding posts, while the input connectors combine DIN sockets with a phono disc input.

The 4040's low-level stages use top quality integrated circuits, with the RIAA effected in two stages. The treble rolloff section is passive, with a separate switchable rumble filter to add the final low-frequency rolloff, this -3dB at 45Hz.

LAB REPORT

The tone controls are incorporated in the feedback loop of the power amplifier section, this a high loop gain design. The strong negative feedback is necessary to reduce the otherwise high level of distortion that results from the use of an unbiased pure Class B output stage, with further assistance given by the Class A driver, which is run at higher than usual current.

Some weakness was exposed by the lab tests. The output specification was just met over the power bandwidth, 8ohms, one channel driven. The small power supply was reflected by the loss into 4ohm on continuous drive, but it made a good try at the 2ohm load on peaks, the level here falling by a reasonable 4.5dB below the 8ohm peak level. The peak current capacity was satisfactory at +10, -9A.

Since our previous review the harmonic and intermodulation distortions have improved markedly, at least partly redressing one of our earlier criticisms, though there is still room for improvement nevertheless. The RIAA equalisation continues to show a rather 'rollercoaster' profile, which will play some part in the subjective balance, while remaining within ± 0.4 dB limits.

Stereo separation was about average and channel balance good except at very low volume settings where a 5dB error appeared. Input sensitivities were rather low, particularly auxiliary, this measuring 70mV as

opposed to the usual 20mV or so. Disc equalisation had significant error in the treble.

SOUND QUALITY

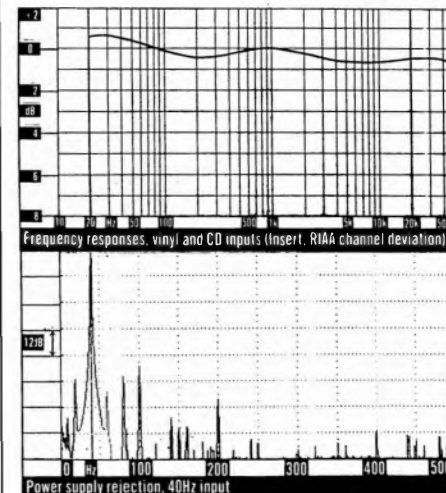
The Creek proved a most controversial performer during the listening tests, splitting the panel between those who found its failings unacceptable and those who rated its strengths as more important than its limitations. Sonically it was rather coloured, but the slightly 'forward' midband showed fine focus and projection. The treble was rather grainy and coarse, but restrained in terms of the balance, while the bass had good 'life' if rather 'thickened' textures. Though short on transparency and stereo subtleties, there was a good sense of timing, 'speed' and integration which was found musically involving. Certainly it is rather different from the norm - something of an acquired taste perhaps?

CONCLUSIONS

This model is difficult to sum up, as individual reactions varied significantly. Though the 'averaged' mark is sufficient to rate recommendation, our advice must certainly be to try it for yourself. Subjectives aside, it is encouraging to note the improvements in our measured findings this time around. Though still not a Creek strength, there are certainly now fewer grounds for criticism in this respect.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		35W (= 15.5dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	15.5dBW 16.1dBW 16.0dBW		
Both channels, 4ohm load	11.0dBW 13.9dBW 13.2dBW		
One channel, 2ohms, pulsed	8.5dBW 12.0dBW 12.6dBW		
Instantaneous peak current		+10A	-9A
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux/CD in.	-60dB -69dB -51dB		
Intermodulation, 19/20kHz, rated power, aux input		-57dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)		27dB	
Noise			
Disc (mm) input (1HF, CCIR weighted)		-74dB	
Aux/CD input (1HF, CCIR weighted)		-75dB	
Residual, unweighted (volume control at min)		-61dB	
DC output offset		2mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	23.6dB 22.9dB -16.3dB		
Aux/CD input (1HF)	>20dB >20dB >20dB		
Stereo separation			
Disc input (mm)	69dB -67dB -43dB		
Aux/CD input	-65dB -65dB -40dB		
Output impedance (damp)	0.03ohm 0.04ohm 0.09ohm		
Channel balance, disc, at 1kHz		0.04dB	
Volume/balance tracking			
Aux/CD input	0dB 0.6dB 0.2dB	-60dB 5.1dB	
Input data			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.47mV	47kohms 220pF
Aux/CD input	DIN	70.4mV	54kohms —pF
Disc equalisation error, 30Hz-15kHz		+0.4dB	-0.4dB
Size (width, height, depth)		42x6x18cm	
Typical price inc VAT		£145	
*Reassessed			



DBX CX3/DX3

SOUNDTEC MARKETING, UNIT 9 BELFONTRADING EST., MUCKLOW HILL, HALESOWEN, W. MIDS. B62 8DR. TEL: (021) 550 7387.



A new range of dbx products are now available in this country from Soundtec Marketing, including this pre-power amplifier combination which is interestingly different from normal because of its 4-channel capability.

The CX3 pre-amplifier is packed with facilities besides a surround sound feature that offers on-board deprocessing of Dolby Surround (for film soundtracks from VCRs), plus two matrix simulations. It has a solid, well made case, finished in black with natural wood end cappings. Internal construction is strictly mass market, standard quality grade, with no pretensions to audiophile appeal, opting instead for the extra facilities. Circuits are constructed around standard quality integrated circuits mounted on several printed circuit boards, mainly interconnected by ribbon cable. The power supply is based on a small transformer with smoothing provided by 1,000µF capacitors. One of the PCBs wasn't properly supported; when some of the selector buttons were operated, it moved, putting strain on connectors and switches alike.

The power amplifier has four separate channels to complement the full surround sound capability of the pre-amplifier, and is consequently large and imposing. The front panel is dominated by two large illuminated analogue power meters, which can be switched between different sensitivities and the various channels. Separate volume controls are provided for each channel, and the general styling matches the pre-amp. The amplifier can deliver a sizeable 300W when operated in bridged mode, while two, three or four loudspeakers may be connected in different permutations.

Internally, a separate printed circuit board is used for each of the four channels. As in the pre-amplifier, commercial grade components are used throughout - NEC integrated driver circuits with discrete transistor, relay protected output stages. The power supply is based on one large, cased toroidal transformer feeding a pair of 18,000µF capacitors, shared between the channels.

LAB RESULTS

The pre-amplifier measurements were competent in most areas, showing very good intermodulation and total harmonic distortion

figures. Noise performance was generally good though the moving-coil disc input was a little below par. Disc input overload margins though decreased with frequency while still remaining adequate. Stereo separation also deteriorated with frequency: good in the midband, it was rather poor at high frequencies.

Channel balance and output impedance were adequate, and input sensitivities were fairly standard, offering sensible load impedances. The moving-coil RIAA response was rolled off at the bass end, whereas the moving magnet input was relatively flat to 10Hz. However, on both disc settings the response started to rise above 5kHz, and was rather uncontrolled at ultrasonic frequencies, which is a shade alarming.

The power amplifier provided a considerable 23.5dBW across the audio bandwidth into 8ohms with one channel driven. The output was fairly well maintained into 4ohms with two channels driven, but the pulsed drive into 2ohms delivered an unimpressive 15dBW, so difficult loads are obviously better avoided. The peak current capability was quite satisfactory for the rated output with two channels driven.

SOUND QUALITY

Auditioning was complicated by the large array of alternatives and facilities. The pre-amplifier was ultimately auditioned with controls 'flat'; the power amplifier was tried in high power stereo 'bridged' mode, and with medium power stereo (in four channel mode).

The pre-amp sound was barely average, with little difference between analogue and digital disc inputs. The strongest point was pretty good bass, but the midband sounded muddled, with a thin 'hard' tonal quality. The treble lacked focus and sounded 'busy' with a degree of 'grain' and 'sibilance'. Stereo depth was poorer than average, offering little drama or listening involvement.

The strong bass continued on CD, along with a welcome improvement in midrange stereo depth. However, the hardness was more obtrusive, and the treble sounded 'edgy' and electronic.

Undoubtedly very powerful, the power amplifier unfortunately sounded below average in bridged mode. Stereo was rather defocused, depth poor, and little grip or dynamic authority was apparent. It improved considerably in the lower power stereo mode, with vastly better focus, moderate depth even in the treble, and superior definition. Dynamics were still weak, however.

CONCLUSIONS

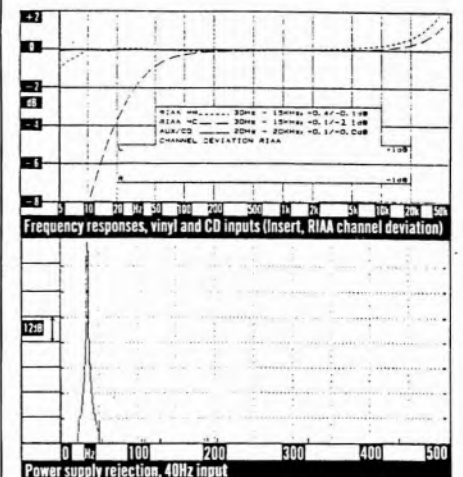
With flamboyant presentation, the dbx separates are visually impressive and provide a wide range of surround sound facilities. In this respect I do not doubt that it is a high class performer. However, in the context of

this comparative review, and auditioned in normal stereo mode, the sonic attainment was unexceptional for the price. Let's leave it at a worth considering level, particularly for the surround sound enthusiast.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	125W (=21dBW)		
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	23.6dBW 23.8dBW 23.5dBW		
Both channels, 4ohm load	21.9dBW 21.9dBW 21.5dBW		
One channel, 2ohms, pulsed	-dBW 15dBW -dBW		
Instantaneous peak current	+24A -23A		
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux/CD in.	-91dB -90dB -84dB		
Intermodulation, 19/20kHz, rated power, aux input	-90dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	-86dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-70dB		
Noise			
Disc (mm) input (1HF, CCIR weighted)	-78dB		
Disc (mc) input (1HF, CCIR weighted)	-62dB		
Aux/CD input (1HF, CCIR weighted)	-84dB		
Residual, unweighted (volume control at min)	-88dB		
DC output offset	left 9mV, right 6mV		
DC offset, pre-amp	left 0mV, right 0mV		
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	28dB 27.3dB 25.0dB		
Disc (mc) input (1HF)	31.6dB 27.0dB 21.7dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	72dB 56.0dB 33dB		
Aux/CD input	74dB 58.0dB 33dB		
Output impedance (damp)	600ohm 600ohm 600ohm		
Channel balance, disc, at 1kHz		0.35dB	
Volume/balance tracking			
Aux/CD input	0dB -20dB -		
Input data	0.01eB 0.02eB 1.28dB		
Disc (mm) input	socket type sensitivity loading		
Disc (mm) input	1.19mV 43kohms 60pF		
Disc (mc) input	0.119mV 100ohms n/a nF		
Aux/CD input	91.5mV 20kohms 200pF		
Power amp	110mV 17kohms 150pF		
Output, pre-amp (tape)	8.5V max, 600ohms		
Disc equalisation error, 30Hz-15kHz	+0.1dB, -2.1dB		
Size (width, height, depth)	47.7x10x35cm		
Typical price inc VAT	£1,500		

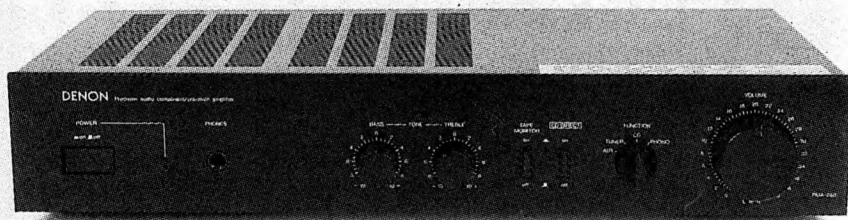
*See text



DENON PMA-250

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

RECOMMENDED



Building upon the undoubted success of their 'budget' 707 model, Denon moved a little upmarket to the next convenient price point with the £125 PMA-250. Recently uprated to a still modest 30W/channel, this offers a little more 'under the skin' engineering in an even simpler 'straight line' design which is clearly intended to accept some of the compromises necessary to achieve good sound quality. For example, there is no switching in the output to the loudspeakers, so headphone listeners will have to unplug the speakers (at the amplifier and with a little care please) if they want to avoid disturbing others.

Tone controls are still fitted, and can only be bypassed when using the CD input, but they remain the only unnecessary frills. The rest of the front panel offers only input switching (MM only disc), tape monitor and 'CD direct' pushbuttons, plus the headphone jack, volume control and on/off switch. The rear panel uses phono inputs throughout, with substantial binding posts providing high quality connection for a single pair of loudspeakers. Internally there is evidence of care and expense taken in selecting high quality components for enhanced sound quality, the sort of approach normally only adopted by smaller, more specialist manufacturers.

LAB REPORT

Technically this amplifier has a conventional class A/B direct-coupled complementary bipolar output, with IC driver stage. It is clearly derived from the 707, but has an improved power supply and uses more carefully selected high quality components and has a simpler, more direct signal path. Internally it is built to a very high standard, reflecting the external finish in this respect.

The 250 comfortably beat its admittedly modest power rating, the power delivery being reasonably well maintained into lower impedances, though the ultimate current capability is adequate rather than generous. Distortion was low, and signal-to-noise ratios were satisfactory. Stereo separation and input overload margins both measured very well.

Though input sensitivities are sensibly chosen, note that the disc input already has

250pF capacitance loading; add another 100pF or so for the leadout wires and the total might be on the high side for ideal matching with the odd cartridge, though most will match fine. The power supply modulation test gave a decent enough result, mains harmonics being below signal harmonics. There is a little room for improvement in volume control tracking, indicative of component tolerancing perhaps. A similar factor may explain the RIAA equalisation; the gentle undulation here will probably play a minor role in determining the overall character of the sound from disc. There is no evidence of bandlimiting on the disc input, so results may vary somewhat with different turntable systems.

SOUND QUALITY

The 250 was rated comfortably above average, good for the price, and towards the top of an increasingly varied and extensive range of 'budget plus' integrated amplifiers from both UK and Far Eastern sources. The sound was distinctively more 'open' than that found with more complex designs, with some attempt at depth portrayal and proper stereo staging, albeit at a sub-audiophile level. Dynamics were quite lively with an attractively 'bouncy' character, while remaining generally tidy and coherent, though the sound lacked a little 'sparkle' and any real sense of 'scale'.

CONCLUSIONS

Improving significantly on the sound quality of its 707 predecessor, though to some extent reflecting the steady forward progress of the market as a whole, the 250 turned out to be a well balanced package, sensibly conceived and attractively priced. At the £125 stated typical price, it is certainly Recommended, successfully creating a blend with broad appeal across a wide range of tastes.

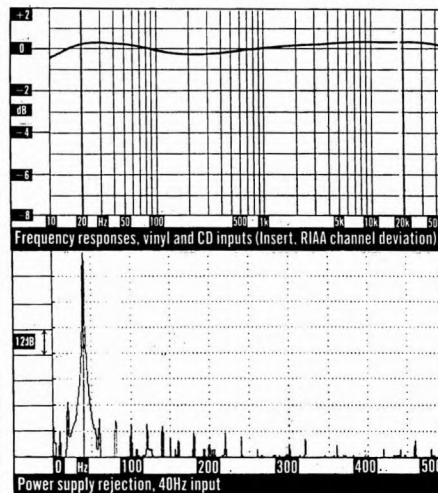
Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

		Integrated amplifier		
		30W (= 14.5dBW)		
Power output		20Hz	1kHz	20kHz
Rated power into 8ohms, maker's spec				
Power output		20Hz	1kHz	20kHz
One channel, 8ohm load		16.5dBW	16.6dBW	16.6dBW
Both channels, 4ohm load		13.3dBW	13.8dBW	13.7dBW
One channel, 2ohms, pulsed		-dBW	13.5dBW	-dBW
Instantaneous peak current		+9.5A	-	-9.5A
Distortion		20Hz	1kHz	20kHz
Total harmonic distortion, at rated power, aux/CD in.		-83dB	-87dB	-68dB
Intermodulation, 19/20kHz, rated power, aux input		-	-	-101dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)		-	-	-75dB
Noise				
Disc (mm) input (1HF, CCIR weighted)				-68dB
Aux/CD input (1HF, CCIR weighted)				-75dB
Residual, unweighted (volume control at min)				-79dB
DC output offset			left -19mV, right -18mV	
Input overload		20Hz	1kHz	20kHz
Disc (mm) input (1HF)		32.5dB	31.9dB	30.8dB
Aux/CD input (1HF)		>20dB	>20dB	>20dB
Stereo separation				
Disc input (mm)		69dB	54dB	61dB
Aux/CD input		73dB	54dB	61dB
Output impedance (damp)		0.24ohm	0.24ohm	0.24ohm
Channel balance, disc, at 1kHz				0.02dB
Volume/balance tracking				
Aux/CD input		0.06dB	0.39dB	3.94dB
Input data	socket type	sensitivity	loading	
Disc (mm) input	Phono	0.56mV	47kohms	250pF
Aux/CD input	Phono	32.3mV	90kohms	40pF
Output, pre-amp (tape)			10.9V max,	100ohms
Disc equalisation error, 30Hz-15kHz			+0.32dB,	-0.33dB
Size (width, height, depth)				43.5x8.5x26cm
Typical price inc VAT				£125
Reassessed				

Note: The author provided a private opinion on an earlier version of this model for the manufacturer.



HARMAN KARDON 640 Vxi

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



Smallest and cheapest of the HK amplifiers tested in this issue, the *PM640* is only rated at 45W per channel, yet is described as having a generous peak current capacity for good loudspeaker load tolerance.

External finish is to a high standard and styling is conservative and functional. A full range of features is packed into this compact unit, which will suit those who enjoy interacting with their equipment. The full range of inputs include two tape monitors, disc (moving magnet only), tuner, and both CD and video. Two sets of speakers and one of headphones can be individually switched as required. Bass and treble tone controls have 10dB of cut or boost, and there is also a loudness mode.

A switch located close to the loudspeaker terminals on the back panel can be set to either 4 or 8ohms for speaker matching. In the latter case a 'high voltage' indicator is illuminated on the front panel (the one marked 'high current' is merely a system function light). The power supply voltage is increased in the 'high voltage' mode hence providing more signal headroom and higher powers into higher impedances; on the 4ohms setting higher currents are available at a reduced voltage to drive lower impedance and reactive loads.

Internal construction is typical of many Japanese built amplifiers, with no fewer than 10 separate printed circuit boards. However, wiring has been kept to a minimum, with ribbon cable in good use and screened cable where necessary. No integrated circuits are found anywhere in the design; all gain stages are constructed from discrete transistors. The power supply, located on the main amplifier board, uses 2x8,200 μ F smoothing capacitors. Components are of standard commercial quality and construction is neat and tidy.

LAB REPORT

Easily exceeding its rated output, 18dBW was available into an 8ohm load and a capable 16dBW into 4ohms. The amplifier also produced a very worthy 18dBW into 2ohms on the pulsed test, and generated ± 17 A peak current, confirming HK's claims.

Harmonic distortion at rated power was higher than most, the probable cause being the low negative feedback used in this design. Intermodulation distortion was reasonably well suppressed, and input overload margins were certainly more than adequate. Noise performance was good on all inputs, and the DC output offset was negligible. Stereo separation was commendable and channel balance was well maintained throughout the measured range of the volume control. Input characteristics were fairly standard, and output impedance was low.

RIAA equalisation was reasonably accurate over the audio bandwidth, though the ultrasonic rise above 20kHz is a little worrying. However, the channels were very well matched and the spectrogram for $\frac{2}{3}$ power, 4ohms showed only signal harmonics, with no mains related components.

SOUND QUALITY

Very little difference in sound quality was detected between the 4 and 8ohms settings, except at full power where 8ohms went a little louder. Rated 'good' on both analogue disc and line inputs, with a marginal preference for the latter, the *640* turned out to be a strong performer with the potential for high sound levels using appropriate speakers. The sound *via* CD was well balanced with more sweetness than usual, for example on massed strings. The treble was good if a little 'forward', while the taut and articulate bass tended to dryness. Resolution of detail was pretty good and stereo focus better still; stereo depth was only moderately good.

Some mild loss of focus, depth and detail was noted *via* analogue disc (moving magnet only). The bass remained firm and well defined, while the treble retained an essentially musical character, with good string tone noticed through the upper midrange. 'Grain' and 'tizz' were held to moderate levels, but detail could have been better.

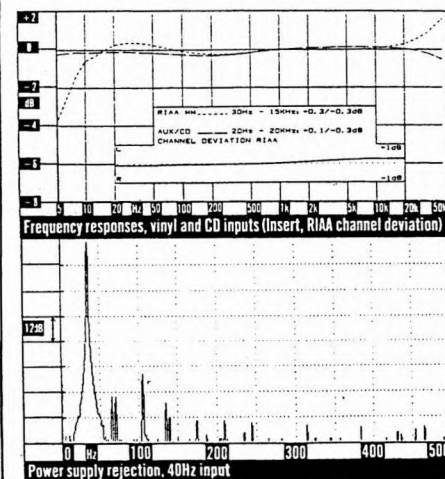
CONCLUSIONS

Though obviously not a Best Buy candidate, the *640Vxi* was undoubtedly a quality product of some versatility, offering very good

build and finish with a healthy power output for the price. Good sound quality was the keynote which ultimately ensures Recommendation.

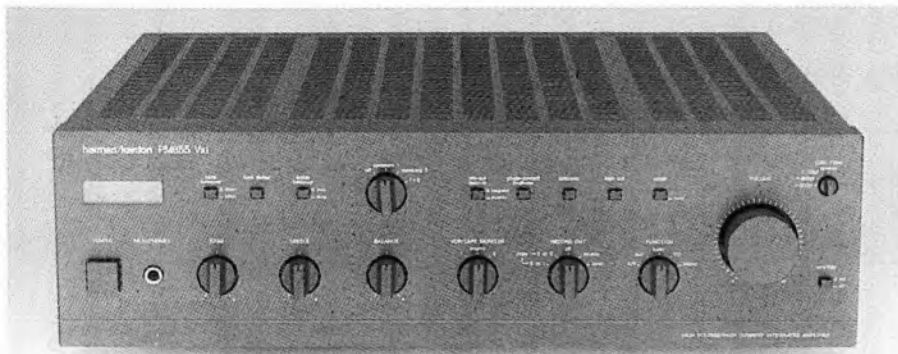
TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		45W (=16.5dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	18.1dBW	18.2dBW	18.1dBW	
Both channels, 4ohm load	15.9dBW	16.5dBW	16.4dBW	
One channel, 2ohms, pulsed	-dBW	18dBW	-dBW	
Instantaneous peak current		+16A	-16A	
Distortion				
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz	
	-60dB	-60dB	-56dB	
Intermodulation, 19/20kHz, rated power, aux input			-71dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-66dB	
Noise				
Disc (mm) input (1HF, CCIR weighted)			-72dB	
Disc (mc) input (1HF, CCIR weighted)			n/a dB	
Aux/CD input (1HF, CCIR weighted)			-76dB	
Residual, unweighted (volume control at min)			-81dB	
DC output offset			left 5mV, right 2mV	
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	28.5dB	28.3dB	27.6dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc input (mm)	65dB	86dB	45dB	
Aux/CD input	65dB	77dB	51dB	
Output impedance (damp)	0.13ohm	0.13ohm	0.16ohm	
Channel balance, disc, at 1kHz			0.57dB	
Volume/balance tracking	0dB	-20dB	-60dB	
Aux/CD input	0.02dB	0.82dB	0.31dB	
Input data				
	socket type	sensitivity	loading	
Disc (mm) input		0.37mV	47kohms	150pF
Aux/CD input		24mV	27kohms	4000pF
Output, pre-amp (tape)			7.6V max, 220ohms	
Disc equalisation error, 30Hz-15kHz			+0.1dB, -0.3dB	
Size (width, height, depth)			44.2x16.2x36.0cm	
Typical price inc VAT			£225	



HARMAN KARDON PM655Vxi

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



Looking much the same as the earlier 655 it replaces, the PM655Vxi integrated amplifier's power rating is increased by 30W to 90W. Again like the earlier model it has a high current capability, and HK claim that it will drive up to 260W per channel under peak demand conditions. Finish is good and the front panel's neat layout covers a multitude of functions.

The standard bass and treble controls are supplemented here by variable frequency turnover points. Four rotary switches allow various combinations of input and output selections. There is the normal input switching, tape monitor with video switching, record out, and speaker selection. The headphone socket remains active at all times. Small pushbuttons choose moving magnet or moving-coil cartridge matching, mono, high cut filter, subsonic filter, loudness, and pre-out/power-in. Various capacitance loadings can be selected for the phono input *via* the front panel, so that moving magnet cartridge responses may be easily tuned.

The rear panel has phono sockets for disc (both mm and m-c), tuner, CD, 'aux', VDP (video disc player), and audio and VCR (video cassette recorder) tape plus video signals to a monitor and separate pre-out and power in. Binding posts are available for 2 sets of speakers, and the user can choose between 8ohm high voltage or 4ohm high current operation.

A single large transformer feeds 4x 6,800µF, creating a separate supply for each channel. The power amplifier is a low feedback, wide bandwidth design with the output transistors mounted under a large internal heatsink with vertical fins. All the circuits are constructed from discrete components, but the RIAA stage is in a separate encapsulation. The various printed circuit boards are connected by ribbon cable where possible, and the general standard of build quality is high.

LAB REPORT

All measurements were taken on the 8ohm setting. The 19.5dBW rating was easily exceeded by a measured 21.4dB output over a good bandwidth, though it was marginally below spec at 19.1dBW into 4ohms. The rated

output was again exceeded on the 2ohm pulsed test. The power supply modulation result is very good, showing some harmonic distortion but virtually no supply breakthrough. However, the DC offset at the speaker terminals is a little worrying, measuring at a high 114mV on one channel and a not much better 70mV on the other. Distortion was generally low but IM increased slightly with the moving-coil stage active.

Noise levels were satisfactory, overload margins were fine on all inputs and the stereo separation was good. Volume/balance tracking was excellent over the entire range of the control, and the output impedance was low. All input sensitivities and loadings were well chosen. The frequency responses were virtually flat within the audio bandwidth on all the measured inputs, and closely tolerated with good matching between channels.

SOUND QUALITY

Auditioned on the 8ohm setting, in practice this amplifier had very good load tolerance and could drive a wide range of loudspeakers to high sound levels, largely confirming the generous output powers recorded in the lab tests. It also performed well in comparative audition, delivering a 'good+' rating throughout, showing remarkable consistency between mm and m-c cartridge and CD sources.

The '655 sounded crisp and clear, uncomplicated and pleasingly 'direct' *via* moving-coil. Good bass extension and slam accompanied good midrange definition on solo parts with only the mildest degree of confusion on more complex passages. The treble was clearly well above average in resolution and accuracy. Stereo images were solidly focused with worthwhile width, depth and ambience. A very mild improvement in definition and clarity was noticed when switching to the moving magnet alternative.

Bypassing the tone controls and filters as usual on the CD source, the amplifier showed a slight midband thinning and hardening. However, this was balanced by fine bass and essentially good treble, with grain and grit kept to moderate levels. The stereo image

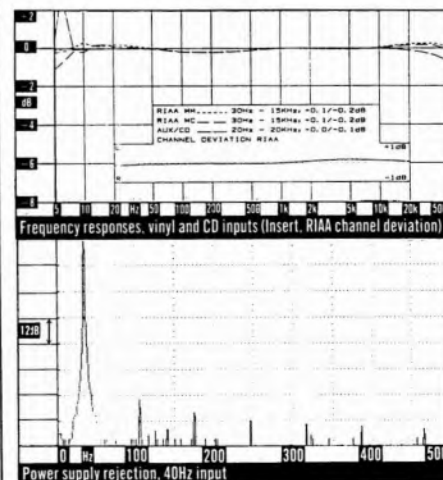
presented a good sense of scale and fine ambience, and the good power delivery was reflected in a fair measure of dynamic life.

CONCLUSIONS

The 'Vxi' update seems to have done the trick, breathing new life into the '655 package. A lusty performer with generous power output and fine tolerance of different loud-speaker loads, it also has a comprehensive lineup of features and facilities. It returned a consistent and substantially good sound *via* all inputs and deserves Recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		90W (= 19.5dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.4dBW	21.5dBW	21.4dBW
Both channels, 4ohm load	19.1dBW	19.4dBW	19.2dBW
One channel, 2ohms, pulsed	-dBW	20dBW	-dBW
Instantaneous peak current		+29A	-26A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in	-71dB	-70dB	-72dB
Intermodulation, 19/20kHz, rated power, aux input			-76dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-73dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-55dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-68dB
Disc (mc) input (1HF, CCIR weighted)			-67dB
Aux/CD input (1HF, CCIR weighted)			-70dB
Residual, unweighted (volume control at min)			-74dB
DC output offset		left 70mV, right 114mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	33.9dB	33.7dB	32dB
Disc (mc) input (1HF)*	30.2dB	29.8dB	28.3dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	53dB	75dB	49dB
Aux/CD input	63dB	77dB	50dB
Output impedance (damp)	0.15ohm	0.15ohm	0.17ohm
Channel balance, disc, at 1kHz			0.27dB
Volume/balance tracking			
Aux/CD input	0.14dB	0.0dB	0.06dB
Input data	socket type	sensitivity	loading
Disc (mm) input		0.243mV	47kohms
Disc (mc) input*		0.016mV	60ohms
Aux/CD input		13.6mV	27kohms
Power amp		85mV	23kohms
Output, pre-amp (tape)			13.5V max, 1kohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, -0.2dB
Size (width, height, depth)			44.0x13.5x40.5cm
Typical price inc VAT			£449



HITACHI HA 007

HITACHI SALES (UK) LTD., HITACHI HOUSE, STATION ROAD, HAYES, MIDDLESEX UB3 4DR. TEL: (01) 848 8787.



Designed very much with the future integration of audio and video in mind, this middle priced, middle sized integrated amplifier has a rated power of 65W (18dBW) per channel. The well finished case may be embellished if desired with the wood end panels provided to beautify freestanding units.

Although lacking a moving-coil input, the Hitachi can hardly be accused of being devoid of features. The 007 has been designed with more than half an eye on the video user, with socketry for a VDP (video disc player). 2 VCRs (video cassette recorder), one of which is accessed *via* the front panel, and a 'video' output for the TV. On the audio side there are the normal array of inputs - phono, CD, tuner and audio tape. Soft touch switches are provided to select any input and to connect any input with any tape output but the tape monitor does not work alongside the Video 2 input.

The customary audio signal shaping is provided by bass and treble controls which can be switched out of circuit as desired, and there are loudness, subsonic filter, mute and stereo/mono switches as well. Two sets of loudspeakers terminals are provided, controlled by a rotary switch on the front panel.

The multi-board construction consists of a mixture of discrete transistors and integrated circuits combined with basic commercial grade passive components to create a competent enough package. The output stage naturally uses a version of Hitachi's own complementary FET design, which has been adopted to such good effect by many other audiophile amplifier manufacturers. The output is relay protected, all internal mains wiring is safety shrouded, and interconnecting harnesses are tidy.

LAB REPORT

The amplifier easily met its power specifications, producing 19.3dBW (85W) into 8ohms throughout the audio spectrum, and 16dBW into 4ohms with both channels driven. The protection circuits started to operate on the 20hm pulsed and peak current tests, limiting the output available.

The 35Hz 2/3 of maximum level supply modulation test was handled with ease indicating a well designed supply and a high common mode rejection. Total harmonic distortion was very low at all frequencies and powers below clip, and the 19kHz/20kHz

intermodulation products were well suppressed on all inputs. Signal-to-noise figures were good *via* the cartridge input, but did not improve much *via* CD or with the volume control set to minimum, indicating that most of the noise was produced in the power amplifier section.

Input overload was adequate at all frequencies into all inputs, and the stereo separation was fine. Volume/balance tracking was good for this price level, and the sensitivities and input loadings are well chosen. A maximum of 9.2V was available from tape output sockets, which should be ample for most purposes. The 'aux' input frequency response was sensibly rolled off at both ends of the frequency spectrum and flat over the important octaves. The RIAA response showed a rising tendency from 50Hz, up almost 1dB at 5kHz, but this was also sensibly rolled off at the frequency extremes, and the two channels matched very well.

SOUND QUALITY

It would be wrong to condemn this model out of hand on the grounds of its unimpressive sound quality rating, as this was in fact reasonable enough - and rather better than this type of product used to achieve a year or two ago. Rated a little below average, it had the virtue of sounding inoffensive and definitely lacking any aggressive or fatiguing tendencies, if a little bland. A check on the effect of the tone control circuitry showed this was responsible for a 'deadening' effect and loss of clarity.

The treble sounded quite open and clear *via* the moving magnet input, but the mid-range was less informative, with rather muted dynamics. Mid textures were 'thickened', while the unimpressive bass was below average in 'tune playing ability' and lacked real slam or punch. Stereo depth was modest, with focus rated average.

A very similar rating was obtained *via* CD, the main impression being a touch of 'cotton wool'. Initially sounding clear enough, subsequent auditioning showed that some of the lower level musical detail was being glossed over. The bass remained soft and lacking in power. Slight improvements in stereo focus and definition were noted with CD.

Taken overall the HA 007 was weak on dynamic speed and low end punch, yet remained easy on the ears. Its strong point

was a treble that it was consistently above average on all sources and inputs. Driven hard, clarity deteriorated rather quickly.

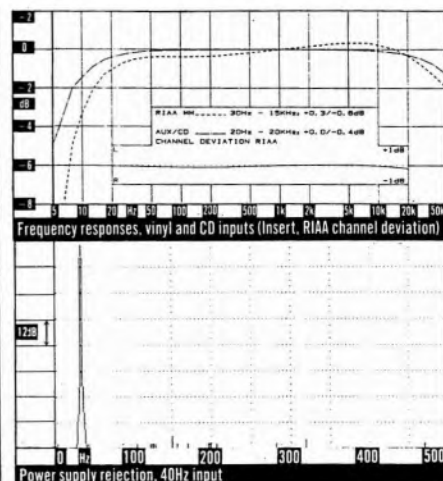
CONCLUSIONS

This modestly priced amplifier turned out a healthy output, but some premature electronic protection effects indicated that more awkward speaker loads (*eg* below 5ohms) should be avoided. The rest of the lab tests were very competent, though a flatter RIAA equalisation response is desirable. Sound quality was below average. Not so seriously as to write-off this model, but sufficiently so as to prevent formal recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		65W (= 18dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.3dBW	19.6dBW	19.4dBW
Both channels, 4ohm load	16.0dBW	16.6dBW	16.6dBW
One channel, 2ohms, pulsed	-dBW	11dBW*	-dBW
Instantaneous peak current		+8A	-8A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-83dB	-84dB	-82dB
Intermodulation, 19/20kHz, rated power, aux input			-46dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			-71dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-73dB
Aux/CD input (1HF, CCIR weighted)			-74dB
Residual, unweighted (volume control at min)			-74dB
DC output offset		left 12mV, right 5mV	
DC offset, pre-amp		left 1nA/mV, right 1nA/mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	31.3dB	30.2dB	27.6dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	83dB	81dB	58dB
Aux/CD input	89dB	79dB	58dB
Output impedance (damp)	0.13ohm	0.13ohm	0.21ohm
Channel balance, disc, at 1kHz			0.11dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.34dB	1.21dB	1.08dB
Input i/a			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.32mV	40kohms 180pF
Aux/CD input	Phono	19.2mV	41kohms 870pF
Power amp	n/a	n/a mV	n/a kohms n/a pF
Output, pre-amp (tape)			9.2V max, 1kohms
Disc equalisation error, 30Hz-15kHz			+0.0dB, -0.4dB
Size (width, height, depth)			37x12.9x30cm
Typical price inc VAT			£299

*See text



INCA TECH DIRK

INCA TECH, 23 LINCOLN WAY, CANVEY ISLAND, ESSEX SS8 9FE. TEL: (0268) 565458.



A product of the CD age with no concession of any kind to black vinyl, the *Dirk* is undoubtedly the smallest 'integrated' amplifier in the issue. It has the barest of facilities and is basically just a stereo power amplifier supplemented by a volume control and tape output.

Inputs are available only for CD and one tape recorder – which is a little hard on those who want to use a tuner as well! The 12x9cm front panel in lacquer finish black with gold lettering has an on/off switch, volume control and a single toggle type selector switch. A green power LED glows dimly. Like the *Claymore* there is a preset balance control to which access can be gained through a hole in the base. (That is, if there is a hole in the base; ours was labelled, but as yet no hole had been drilled.)

The case is constructed in two pieces; the top is steel, the base aluminium. The latter acts as the heatsink, and not surprisingly got 'hot' during the power output testing.

Inside, a fair size toroidal transformer and two Elna 4,700µF smoothing capacitors form the power supply. The amplifier is constructed on single board, using FET operational amplifiers and discrete transistors to feed the MOSFET output stage. Protection is provided by output fuses in the speaker line. Inputs are taken from the phono sockets on the back panel to the selector switch via screened cable, and then straight to the volume control.

LAB REPORT

Achieving the maker's specification with some room to spare, the steady state output power peaked at 17.9dBW with an 8ohm load. Output fell by more than 3dBW with both channels driven into 4ohms, but a respectable 15.5dBW was provided on the 2ohm pulse driven test. The ±20A peak current capability is ample for the stated output.

Total harmonic distortion was fairly high, which probably arises from the low feedback design. Intermodulation distortion was well suppressed and the signal-to-noise ratios are good. DC offset was reasonable at the power amplifier output and the input overload margin was fine. Stereo separation, however, was

unexceptional for a design of this type. Output impedance was low and volume/balance tracking was good except at the bottom end of the track, where substantial 4.5dB error was recorded.

The sensitivity and input loading was sensible, and a healthy 11V is available from the tape output. The frequency response was ruler flat over the audio bandwidth, well extended at high frequencies, and only 0.8dB down at 5Hz. The supply modulation test reveals some harmonic distortion residuals together with 'mains hum' breakthrough, the 100Hz component being only -63dB ref. the two-thirds power 40Hz signal.

SOUND QUALITY

Auditioning was pretty straightforward with only the one input to try out. A high quality CD source was used alongside with other tests to assess load handling ability and loudness. Scoring a respectable 'good plus', the *Dirk* was only a little behind its large *Claymore* brother. The bass sounded snappy and tight with good tune playing abilities. Although the midrange was marred by a degree of hardness and slight brittleness, this was countered by a good transient attack and general definition. The sound was quite clear, with spacious stereo images and quite good focus. Rated well above average, the treble had little 'grain' but lacked a little 'air' and 'sparkle'.

Underpinning the performance was good drive and rhythm. The *Dirk* could be driven to its 50W limit and provided quite good sound levels, but tended to become a bit scrappy if driven any harder. Conversely it handled more awkward speaker loads well, due to healthy current capacity.

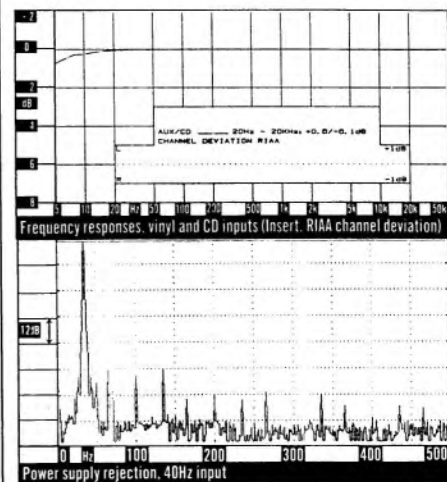
CONCLUSIONS

I suppose that leaving out the analogue disc section is one way of making an economy *Claymore*! (An optional selector switch box with a disc equaliser input is in fact planned as an accessory.) The sound quality was quite respectable and would please CD-only users, but I feel that the *Dirk* is rather too limited in application. It may be worth considering where space is at a premium, but

otherwise a standard model would provide better value.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		50W (= 17dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.4dBW	17.9dBW	17.5dBW
Both channels, 4ohm load	13.3dBW	14.5dBW	14.0dBW
One channel, 2ohms, pulsed	-dBW	15.5dBW	-dBW
Instantaneous peak current		+20A	-20A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-56dB	-54dB	-42dB
Intermodulation, 19/20kHz, rated power, aux input			-81dB
Noise			
Aux/CD input (1HF, CCIR weighted)			-78dB
Residual, unweighted (volume control at min)			-80dB
DC output offset			left 15mV, right 23mV
DC offset, pre-amp			left 0mV, right 0mV
Input overload	20Hz	1kHz	20kHz
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Aux/CD input	53dB	53dB	45dB
Output impedance (damp)	0.15ohm	0.14ohm	0.13ohm
Channel balance, disc, at 1kHz			0dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.03dB	1.22dB	4.5dB
Input data			
Aux/CD input	Phono	18.7mV	28kohms 30pF
Output, pre-amp (tape)			11.3V max, —ohms
Size (width, height, depth)			12.1x9.2x30.5cm
Typical price inc VAT			£215



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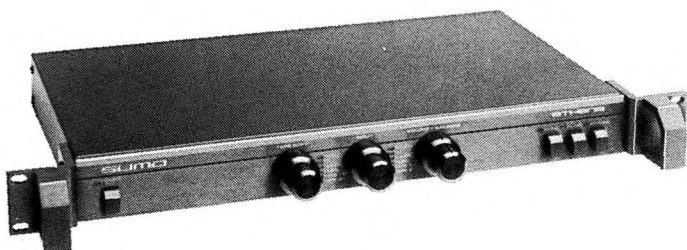
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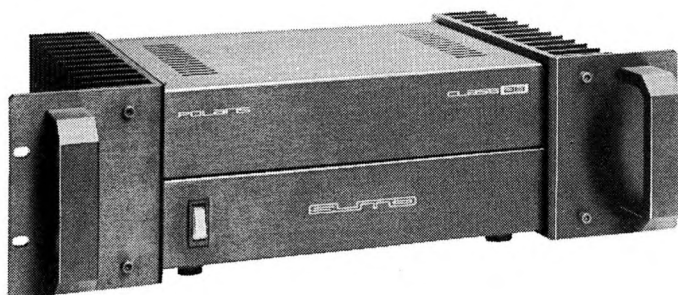
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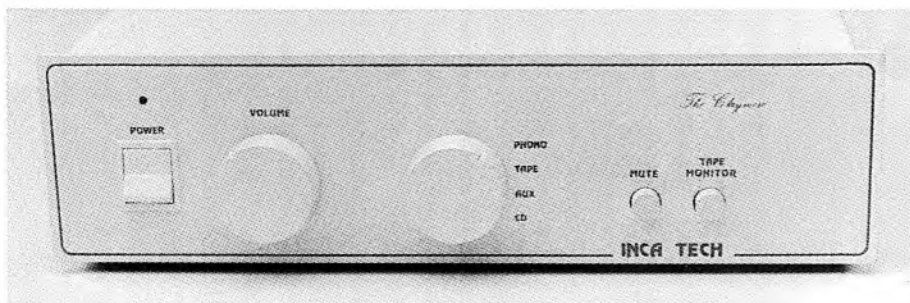
4 ohms. No current limiting. +/- 40 amp peak capability per channel. 1.4kW transformer.
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Acoustic Gold

INCA TECH CLAYMORE

INCA TECH, 23 LINCOLN WAY, CANVEY ISLAND, ESSEX SS8 9FE. TEL: (0268) 565458.

RECOMMENDED



The chunkily styled, cutely titled *Claymore* 50W integrated amplifier has been busily building something of a cult reputation for itself recently, even though it has hitherto avoided *Choice* scrutiny. This British amplifier is available in a variety of colours, and our sample was finished in white with gold lettering and gold plated screws holding the case together. The aspect ratio of the case is higher and narrower than normal, but attractive nonetheless.

Moving-coil cartridge sensitivity can be selected *via* switches accessed through a hole in the bottom of the case. A preset balance control is also set by a screwdriver from underneath. A rotary switch allows selection of disc, CD, and aux, with pushbutton switches selecting tape monitor and mute. The back panel has a standard set of phono signal and 4mm speaker sockets.

The case is made from two 'U'-shaped metal pressings, the chassis of aluminium and the cover of steel. Inside a single double-sided printed circuit board contains all the active circuitry. The toroidal power transformer is mounted directly onto the PCB and feeds 4x4700 μ F Elna smoothing capacitors (one pair per channel).

The power amplifier comprises discrete components feeding the MOSFET output transistors, with the aluminium case acting as heatsink. Good quality commercial grade components are used throughout, and some care has been taken to select components that provide good sound quality at reasonable prices. The disc input stage relies on selected, low noise, high quality operational amplifiers. The speaker terminals are wired to the board *via* spade connectors, which in our opinion benefit from hardwiring. And the volume control could also have been better secured with tighter channel tolerancing.

LAB REPORT

The *Claymore's* 50W rated power was met with only a small margin at 8ohms, and output fell by 3dB with both channels driven into a 4ohm load. However, the peak current was a very adequate $\pm 20A$, which provided a pulsed output of 16dBW into 2ohms on one channel.

Total harmonic distortion was poorer than average, but this is merely indicative of a low feedback design, and there seems little cor-

relation between sound quality and measured harmonic distortion. Intermodulation distortion products were quite well suppressed. With the exception of the moving-coil input, which was just acceptable, noise figures were all very good. DC offset was a little high on one channel. The output impedance was negligible.

Overload margins were unexceptional but should be adequate in practice. Stereo separation was just average, showing some decline at high frequencies. Volume/balance tracking was passable except at low levels, where it would benefit from a better potentiometer. Input sensitivities and loadings have been sensibly selected, while disc equalisation was reasonably accurate, with a subsonic roll off and a slight HF boost that continued above the audio bandwidth. The bass anomalies on the moving magnet charted response were caused by clipping due to the modest overload margins. The power spectrogram results were unexceptional, showing some 100Hz breakthrough.

SOUND QUALITY

First auditioned on the moving-coil input, the *Claymore* sounded dynamic and 'punchy' with a lively sense of drive and rhythm. Stage focus and depth were nicely portrayed, with soloists well separated from the backing performances. Central focus was sharp and stable. The treble was rated above average, essentially free from sibilance or 'grit', though a touch more clarity and sparkle would be welcome. The bass proved articulate and sounded sufficiently extended.

Some improvement in clarity and focus was obtained from the CD input, while the bass sounded faster. The treble appeared more open and the midrange was both impressively detailed and articulate. Here the *Claymore* proved itself, competing with some of the better examples in its class. Driven hard, it clipped without unpleasantness, and higher than expected sound levels could be attained.

CONCLUSIONS

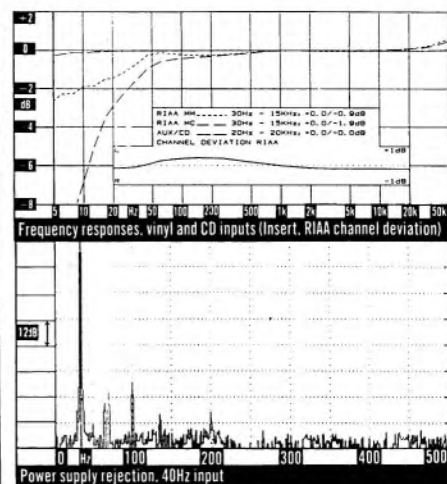
Clearly the good reputation enjoyed by this specialist amplifier has not been misplaced. Constructional standards will hopefully be improved, along with a volume control with better channel matching at low volume settings; the accuracy of the RIAA components

could also have been tighter. On the plus side, it was a load tolerant design offering a good power capacity and a well balanced, musical sound. Mid clarity and instrumental separation were strong points, while the solid, rhythmic bass also deserves mention. Such a performance merits firm recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		50W (= 17dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.3dBW	17.5dBW	17.2dBW
Both channels, 4ohm load	13.8dBW	14.4dBW	13.9dBW
One channel, 2ohms, pulsed	-dBW	16dBW	-dBW
Instantaneous peak current		+20A	-20A
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz
	-50dB	-51dB	-48dB
Intermodulation, 19/20kHz, rated power, aux input			-78dB
Intermodulation, 19/20kHz, at 0dB, disc (mm)			-68dB
Intermodulation, 19/20kHz, at 0dB, disc (mc)			-62dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-78.0dB
Disc (mc) input (1HF, CCIR weighted)			-63dB
Aux/CD input (1HF, CCIR weighted)			-86dB
Residual, unweighted (volume control at min)			-88dB
DC output offset		left 1mV, right 35mV	
DC offset, pre-amp		left n/a, mV, right n/a mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	17.8dB	17.2dB	15.6dB
Disc (mc) input (1HF)*	20.1dB	16.6dB	14.39dB
Aux/CD input (1HF)	15.6dB	15.6dB	13.8dB
Stereo separation			
Disc input (mm)	57dB	56dB	34dB
Aux/CD input	52dB	50dB	35dB
Output impedance (damp)	0.05ohm	0.05ohm	0.06ohm
Channel balance, disc, at 1kHz			0.27dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.0dB	1.84dB	7.0dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.27mV	28kohms 140pf
Disc (mc) input*		0.264mV	470ohms n/a nF
Aux/CD input		27.2mV	35kohms 20pf
Output, pre-amp (tape)			10V max, —ohms
Disc equalisation error, 30Hz-15kHz			+0dB, -1.9dB
Size (width, height, depth)			34x9.4x30cm
Typical price inc VAT			£345

*See text



KENWOOD KA-550

TRIO KENWOOD UK LTD, 17 BRISTOL ROAD, METROPOLITAN CENTRE, GREENFORD, MIDDX UB6 8UP. TEL: 01-575 6030



The KA-550 is a 40W integrated model, retailing for around £130. Very smartly finished and sensibly laid out, it makes a few compromises in the interests of convenience, notably the separately switched accommodation for two sets of loudspeakers. But Kenwood have clearly made an effort to keep signal paths short for the sake of sound quality, and unlike many of its immediate rivals in this increasingly competitive sector of the marketplace, the 550 sports a moving magnet/moving-coil cartridge matching option.

Aside from the prominent power switch and volume control, the top section of the fascia provides 'CD Direct' and 'line straight' switching. The lower section has a set of large pushbuttons for input and tape monitoring selection, small pushbuttons select loudspeakers, subsonic filter, -30dB attenuation, and mm/m-c cartridge. The rear panel uses phono sockets throughout, and generous binding posts for loudspeaker connection.

LAB REPORT

Differential FETs improve the performance of the disc input IC op amps to the point where the mm/m-c option is feasible. Both the 'direct' switch routes shorten internal signal paths, and some care has been taken over the circuit layout. The power amps are fully integrated hybrid ICs using conventional complementary configuration, fed from a decent size power supply with separate regulation to earlier stages.

Power delivery clearly exceeded the specification when one channel was driven into 8ohms, and still held up reasonably well into lower impedances, reflecting the generous, if somewhat asymmetric current capability. The power supply modulation spectrogram shows generally good isolation and behaviour.

The various distortion and noise measurements were all good, input overload margins were ample, and stereo separation was very respectable too. The various input parameters all appear to be sensibly chosen. The RIAA disc equalisation was commendably flat and sensibly bandlimited particularly *via*

moving-coil (the mm trace shows much less low frequency curtailment).

SOUND QUALITY

Rating comfortably above average, the 550 proved to be a gutsy performer, with decent bass 'speed' and 'attack', albeit lacking a little in 'weight' and accompanied by a little 'untidiness' in the treble. Stereo imagery was well portrayed, with fairly good focus and only mild depth curtailment. Furthermore, the moving-coil cartridge input was no also-ran of indifferent performance as has been the case with some cheaper integrated amplifiers over the years: it is genuinely as capable as the other inputs, which is to Kenwood's credit.

CONCLUSIONS

Deserving firm recommendation on the basis of its decent sound quality at an affordable price, the 550 has the additional bonuses of fine finish and build quality and a capable moving-coil input, the latter something of a rarity amongst its immediate competition and a definite plus point.

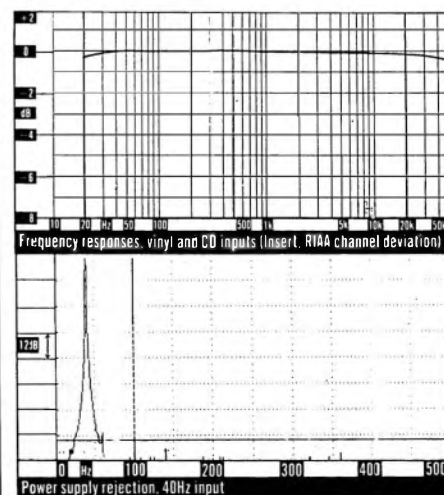
Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		40W (= 16dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.8dBW	18dBW	17.8dBW
Both channels, 4ohm load	15dBW	15.5dBW	15dBW
One channel, 2ohms, pulsed	-dBW	16dBW	-dBW
Instantaneous peak current		+13A	-17A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-74dB	-85dB	-74dB
Intermodulation, 19/20kHz, rated power, aux input			-92dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-80dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-60dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-73dB
Disc (mc) input (1HF, CCIR weighted)			-67dB
Aux/CD input (1HF, CCIR weighted)			-74dB
Residual, unweighted (volume control at min)			-91dB
DC output offset		left < 5mV, right < 5mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	34dB	33dB	32dB
Disc (mc) input (1HF)*	33dB	32dB	28dB
Aux/CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	67dB	71dB	48dB
Aux/CD input	80dB	70dB	50dB
Output impedance (damp)	0.15ohm	0.15ohm	0.25ohm
Channel balance, disc, at 1kHz			0.21dB
Volume/balance tracking			
Aux/CD input	0.03dB	0.1dB	0.2dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.4mV	47kohms 180pf
Disc (mc) input*	Phono	0.04mV	100ohms n/a pf
Aux/CD input	Phono	26mV	57kohms 450pf
Output, pre-amp (tape)		13.4V max	220ohms
Disc equalisation error, 30Hz-15kHz		+0dB, -0.4dB	
Size (width, height, depth)		42x10.5x33cm	
Typical price inc VAT			£130

Reassessed



LUXMAN LV100

HW INTERNATIONAL LTD., 3-5 EDEN GROVE, LONDON N7 8EQ. TEL: 01-607 2717.



The £200 Luxman LV100 is rated at 40W per channel, and taken at face value is typical of many mainstream products from the Far East. There is only so much you can do with the styling of a standard size box finished in the obligatory satin black, but Luxman have done a good job in placing the controls in a logical pattern while maintaining good aesthetics.

All the normal facilities are present – tone controls, subsonic filter, loudness and balance. The inputs do not include provision for a moving-coil cartridge, but there is moving magnet disc, CD, 'aux', tuner and facilities for two tape decks. Outputs are provided for two sets of speakers (connected *via* spring clips) which may be switched from the front panel, plus the headphone socket. Another facility called 'CD straight' causes the CD input to bypass the tape output and the subsonic filter, but strangely not the loudness or tone controls. (Normally 'CD straight' routes the CD past the tone controls, creating a direct link.

The active internal circuitry is on two boards and based around integrated and hybrid thick film circuits. The passive components are of standard commercial grade throughout, and the power supply uses two 6,800 μ F main smoothing capacitors. The output is relay protected, and the only real criticism concerns bare mains terminals inside which ought to be shrouded.

LAB RESULTS

Rated at 16dBW, the amplifier produced a considerable 18.1dBW over the power bandwidth into an 8ohm load. Though the power fell into 4ohms, the output was still maintained at 68 watts per channel with both channels driven – a good result. Into lower resistance loads some limiting occurred: 13.5dBW was recorded on the 2ohm pulse test, and only ± 5 A instantaneous peak current was available. Thus the more awkward loudspeaker loadings are better avoided.

There can be no complaint about distortion, either harmonic or intermodulation – typically better than –80dB on auxiliary input, and still a very credible –70dB IM on

disc. Signal-to-noise ratios could have been better, but in practice are probably good enough, given healthy input signals. Disc overload margins were fine. Channel separation was good at low frequencies, but the 20kHz performance can only be described as weak, particularly on the 'aux/CD' input. Channel balance was good and the input sensitivities and loading are sensibly selected.

The RIAA response shows a generally rising trend throughout the audio spectrum but this has been kept within passable +0.6/–0.4dB limits. The 'aux/CD' response exhibits a slight suck-out in the bass region, but this also is not serious. The power supply modulation spectogram shows slight 50Hz breakthrough, but higher harmonics are well suppressed.

SOUND QUALITY

In common with a number of other new generation amplifiers from well established Japanese manufacturers, the LV100 delivered a promising standard of sound quality. Considered well balanced and musical, the scores for analogue disc (moving magnet) and compact disc were consistently above average for this type of amplifier.

The mm disc sound was clearly not over ambitious, but what it did attempt was carried out with thorough competence. The mid register sounded clear and open, and the treble showed some life and 'sparkle'. Recovery of the natural attack and dynamics present in the programme was more than satisfactory. However, some mild 'fizz' was noted in the treble, while the bass was 'lightened'. Modest depth and ambience were present, while stereo focus rated only average.

Auditioned *via* 'CD direct' with no other spurious facilities, the CD input delivered a very similar score – at least the two inputs were consistent though more usually one can expect a slight improvement due to the simpler, shorter signal path. The amplifier possessed a degree of tonal 'sharpness' which helped the analogue result somewhat, but consequently CD sources sounded a touch 'brittle' and 'harsh', countered by improvements in stereo focus and depth. The result

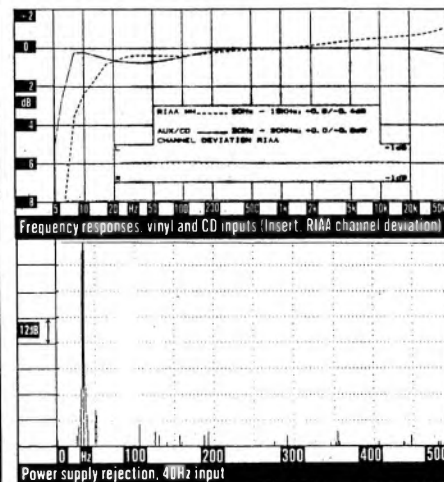
was quite cheerful if the amp were not driven too hard, but high level drive into awkward loadings resulted in early and aggressive clipping.

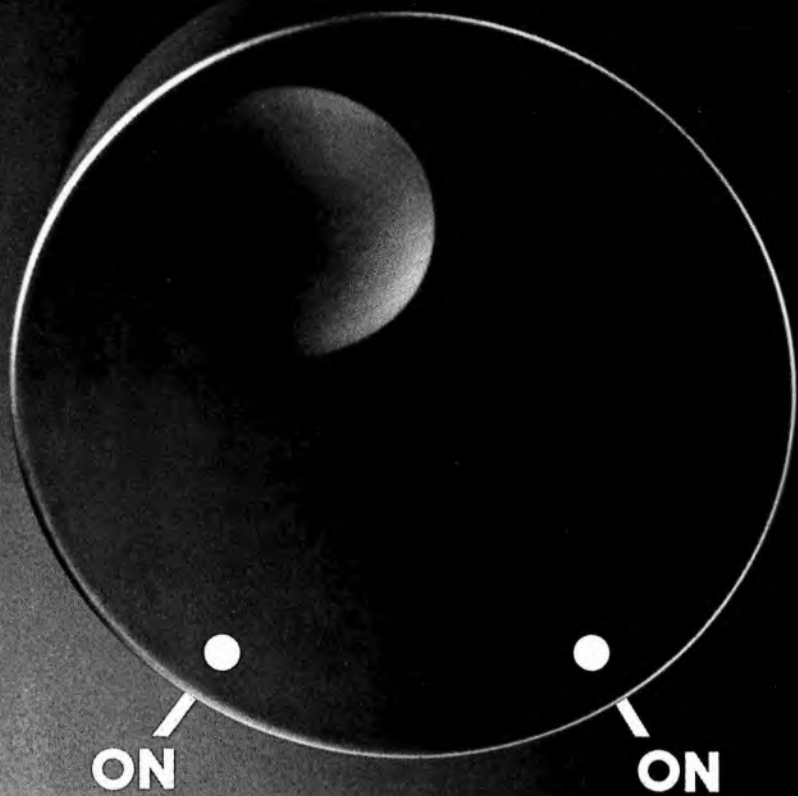
CONCLUSIONS

Aside from some restriction on the use of the nastier 4ohm speaker loads (fortunately rather rare in practice), the LV100 survived quite well, and constitutes a pleasant amplifier offering good build and finish at a moderate enough price.

TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		40W (= 16dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	18.2dBW	18.3dBW	18.1dBW	
Both channels, 4ohm load	15.0dBW	15.4dBW	15.1dBW	
One channel, 2ohms, pulsed	–dBW	13.5dBW	–dBW	
Instantaneous peak current		+5A	–5A	
Distortion		20Hz	1kHz	20kHz
Total harmonic distortion, at rated power, aux/CD in.		–91dB	–88dB	–75dB
Intermodulation, 19/20kHz, rated power, aux input				–81dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)				–70dB
Noise				
Disc (mm) input (1HF, CCIR weighted)				–68dB
Aux/CD input (1HF, CCIR weighted)				–74dB
Residual, unweighted (volume control at min)				–74dB
DC output offset				left –8mV, right +7mV
DC offset, pre-amp				left/n/a/mV, right/n/a/mV
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	32.5dB	31.7dB	26.7dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc input (mm)		70dB	60dB	34dB
Aux/CD input		71dB	54dB	30dB
Output impedance (damp)		0.30ohm	0.30ohm	0.33ohm
Channel balance, disc, at 1kHz				0dB
Volume/balance tracking		0dB	–20dB	–60dB
Aux/CD input		0.09dB	0.21dB	0.20dB
Input data		socket type	sensitivity	loading
Disc (mm) input			0.39mV	46kohms 35pF
Aux/CD input			25.5mV	56kohms 170pF
Output, pre-amp (tape)				11V max, 470ohms
Disc equalisation error, 30Hz–15kHz				+0.6dB, –0.4dB
Size (width, height, depth)				43.8x11.0x27.8cm
Typical price inc VAT				£205





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MARANTZ PM35

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

RECOMMENDED



The manual describes the *PM-35* as a 'digital monitoring amplifier' but this is puffery; in reality it is little different from many others, being constructed from conventional analogue circuitry. The fairly modest power output claims are for 45W into 8ohms and 50W into 4ohms.

The *PM-35* looks like a smaller version of the *PM-45* tested in the last *Hi-Fi Choice: Amplifiers*, and like that model has been tweaked to achieve an audiophile-oriented sound quality alongside the Far Eastern inspired features. The latter include loudness and bass and treble controls, all of which can be bypassed if required, and when 'CD/phono direct' is selected the ordinary selector switch, balance control and tape circuits are bypassed.

The rotary selector switch allows choice of CD, phono (moving magnet or moving-coil), tuner, or TV/aux, a horizontal row of LEDs advising the current status. A separate tape monitor switch is provided and also a 'sub speaker' switch to turn on the second set of speakers. Insertion of the headphone jack automatically mutes loudspeakers. The back panel has a row of phono sockets at one end and two sets of loudspeaker binding posts in the centre.

Some care has been spent to bring the internals into line with European thinking. Although of multi-board construction, a more direct signal route has been achieved by adopting such things as remote selector switches near the inputs. The active circuitry is a mixture of discrete devices and integrated circuits, and many of the passive components in important circuit locations have been chosen especially for their sound quality. For instance, Elna specialist 6,800µF caps are used for smoothing in the power supply. The output is relay protected, but internal mains connections are not shrouded. Copper plated screws hold the workmanlike case together, and well finished plastic knobs and switches are used for the controls.

LAB REPORT

The *35* easily met its power specifications producing 17.3dBW over the audio spectrum into an 8ohm load with one channel driven. Output fell slightly into 4ohms, providing 14.4dBW here. A reasonable 14dBW was achieved on the pulse test into 2ohms, along

with a creditable +12/-11A on the 1ohm/2.2µF peak current test. Total harmonic distortion and intermodulation distortion were satisfactory, though slightly higher than many of its peers.

Noise levels were perfectly adequate and DC offset was almost negligible. Overload margins were satisfactory on all inputs. Stereo separation was fine and output impedance negligible. Volume/balance tracking was well matched over a wide dynamic range, and all input sensitivities and loadings were quite well selected. Tape output was healthy with a low output impedance.

The high quality power supply is confirmed by the excellent modulation spectrogram. The RIAA response shows the IEC roll off below 50Hz, but a mid-bass 'bulge' peaked an audible +0.8dB to 200Hz. However, the response is tolerably flat for this price level.

SOUND QUALITY

The *PM35* achieved an 'above average' mark *via* the moving-coil cartridge input which was only slightly improved in moving magnet mode, so both analogue disc inputs can be regarded as a success, with the mm mode providing slightly the firmer bass. However, bass was not a strong point, sounding 'slow' and emphasised (perhaps due to the measured response effect?). The midband was pleasant enough, free from hardness but lacking some detail. Some depth was present in a stereo soundstage which showed good scale but only average focus. Despite some obvious muting of programme dynamics, it did provide a fair measure of drive and beat.

CD sources improved the score to 'good'. The treble was distinctly classy - separate, transparent and supporting the good stereo presentation. While the sound remained a trifle slow, especially in the bass, it was also eminently musical, proving compatible with some of the best budget CD players such as those produced by Marantz themselves. It remained fairly well controlled when driven to peak levels, and did not really object to adverse loadings.

CONCLUSIONS

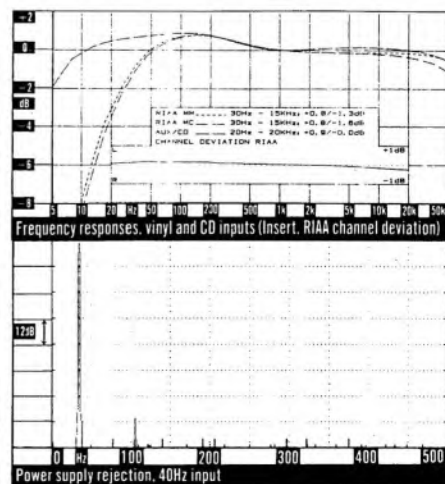
This is a most presentable integrated amplifier with a good range of facilities, thoughtful design and both good build and finish. The lab results were fine, the only significant weakness being the charted frequency

response effect. Load tolerance was good, output power decent, and the package as a whole represents sufficiently good value to merit Recommendation.

TEST RESULTS

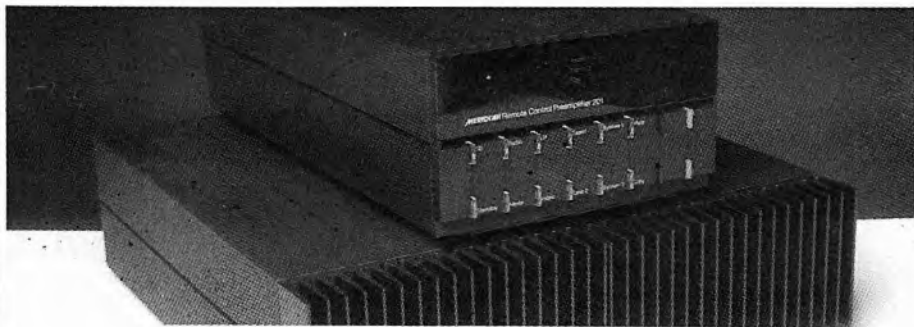
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		45W (= 16.5dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	17.3dBW 17.5dBW 17.4dBW		
Both channels, 4ohm load	14.4dBW 15.3dBW 15dBW		
One channel, 2ohms, pulsed	-dBW 14dBW -dBW		
Instantaneous peak current		+12A	-11A
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz -74dB	1kHz -72dB	20kHz -61dB
Intermodulation, 19/20kHz, rated power, aux input			-50dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-73dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-77dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-76dB
Disc (mc) input (1HF, CCIR weighted)			-64dB
Aux/CD input (1HF, CCIR weighted)			-80dB
Residual, unweighted (volume control at min)			-84dB
DC output offset		left -9mV, right -12mV	
DC offset, pre-amp		left/n/a mV, right/n/a mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	32.9dB 28.7dB 28dB		
Disc (mc) input (1HF)*	34.6dB 29.9dB 29dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	86dB	76dB	58dB
Aux/CD input	86dB	79dB	68dB
Output impedance (damp)	0.056ohm	0.057ohm	0.084ohm
Channel balance, disc, at 1kHz			0.39dB
Volume/balance tracking			
Aux/CD input	0.0dB	1.39dB	1.49dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.40mV	47kohms 360pF
Disc (mc) input*		0.04mV	100ohms n/a nF
Aux/CD input		29.8mV	45kohms 40pF
Output, pre-amp (tape)			9.0V max, 220ohms
Disc equalisation error, 30Hz-15kHz			+0.8dB, -1.3dB
Size (width, height, depth)			42x10x26cm
Typical price inc VAT			£160

*See text



MERIDIAN 201/205

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



This pre/power amplifier combination is part of Meridian's new 200 series. The 201 is a full facility, remote ready pre-amplifier, joining a select but growing breed. The 205s are monoblok amplifiers rated at 100W with good load tolerance. They use 'class AA' non-switching output circuitry and are consequently 'cool' running.

Both units share the same basic extruded alloy case, formed from 2 U-shaped sections, joined together but electrically insulated from one another. Styling is unfussy and attractive; the pre-amp has yellow lettering and details on glass, while the power amp is plain black.

One end of the power amplifier contains the on/off switch, reset button, inputs and speaker connections, the other a finned heatsink. A thick optic fibre protruding from within the fins glows red on standby (automatically set when no input signal is present), and green when operational.

The 201 has a glass front panel behind which lie the LED display, the remote receiver, and operational LED flags. Small perspex input select buttons glow to show operation. All the normal inputs are provided, and the remote access volume control has 64 steps. The back panel contains high quality phono sockets, for tape, 'aux', CD and vinyl disc, the latter switchable internally to either mm or m-c sensitivity.

Each power amplifier has a 3000VA transformer and 2x10,000µF supply capacitors. Four high power output transistors are used, and internal construction is to a high standard. The pre-amplifier is also well built, using low noise LT1028 operational amplifiers for disc input. The 'digital' volume control is based around individual switching FET and resistor arrays.

LAB REPORT

The 205 met its specified 8ohm power output with a small margin, and held up quite well into both the 4ohm static and 2ohm pulsed tests. Peak current delivery was just about adequate, and the protection circuits worked without fuss. Harmonic distortion was reasonable at all frequencies and at both full power and 0dBW, and intermodulation distortion was well suppressed. Signal-to-noise ratios were just about satisfactory, and the DC offset was minimal. The measured fre-

quency response showed a high frequency rolloff from 5kHz, being 2dB down by 20kHz, but we understand this is being corrected.

The 201 exhibited an extended response on the line inputs, and the RIAA equalisation was held within reasonable limits – essentially flat in the midband, with a bass rolloff below 100Hz and with a visible but mild high frequency shelf. Above 20kHz the response of all inputs was sensibly rolled off, and channel deviation was negligible.

Distortion was low throughout, and all inputs were quiet. Overload margins were satisfactory, stereo separation very good, and output impedance low enough to drive long runs of cable (allowing the monoblok power amplifier to be placed close to its loudspeaker). Channel balance was near perfect over the entire volume range, and the input sensitivities and loadings were generally well chosen; however, the 10kohms line input impedance is on the low side.

SOUND QUALITY

The 201 pre-amplifier was the star performer of the pair. Assessed separately, the power amp returned a strong 'good' rating, but the pre-amp's score reached the 'very good' category and could easily partner a more ambitious power amplifier. It is a tribute to the designer that such good performance has been achieved despite the remote control and power volume facilities.

The 201 gave a consistently high performance *via* both the analogue disc and the CD inputs – incidentally, a comparable performance to the pre-amp section of the latest 207 16-bit CD player. Stereo focus was nicely stable, with good depth and ambience recovery from appropriate discs, and a generously wide soundstage. Tonally the midrange was close to neutral, comparisons with top references showing that bass was a mite curtailed and 'thumpy', and the treble had a hint of 'grain' and sibilance. Detail was good despite a trace of midband muddle on complex passages.

There was no doubt of the power amplifiers' superiority over earlier Meridian designs, but the standard of competition has also become fiercer in the past year. The 'fast', tuneful bass was a plus point, while stereo showed fairly good depth and clarity with very good focus, but midrange detail could have been better and the treble sho-

wed a little hash or grain.

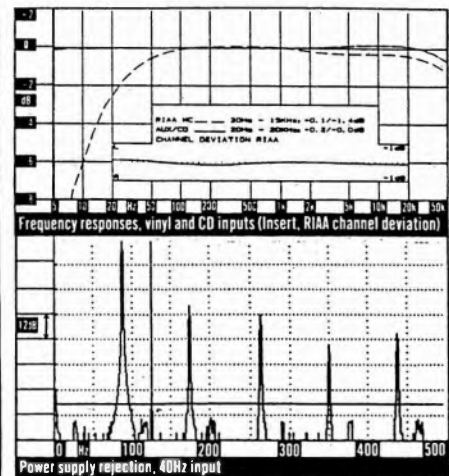
CONCLUSIONS

Despite the mild subjective reservations, the 205 deserves recommendation. Though not top of the league for value, its auto-music sensing confers 'fit and forget' convenience in a compact monoblok. The 201 stands as a fine separate preamplifier in its own right, worth firm recommendation even disregarding its unusual remote control feature (control panel extra). This attractive product deserves a wider exposure.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		100W (= 20dBW)	
Power output	20Hz 1kHz	20kHz	20kHz
One channel, 8ohm load	20.5dBW	21dBW	20.5dBW
Both channels, 4ohm load	19.2dBW	19.8dBW	19.1dBW
One channel, 2ohms, pulsed	-dBW	19.5dBW	-dBW
Instantaneous peak current		+20A	-18.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-60dB	-62dB	-51dB
Intermodulation, 19/20kHz, rated power, aux input			-65dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-81dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-71dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-78dB
Disc (mc) input (1HF, CCIR weighted)			-73dB
Aux/CD input (1HF, CCIR weighted)			-85dB
Residual, unweighted (volume control at min)			< -100dB
DC output offset			left 3mV, right 6mV
DC offset, pre-amp			left 2mV, right 4mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)			not tested
Disc (mc) input (1HF)*	23.4dB	19.9dB	20.1dB
Aux/CD input (1HF)	>23dB	>22.5dB	>22.5dB
Stereo separation			
Disc input (mm)	90dB	87dB	78dB
Aux/CD input	116dB	116dB	95dB
Output impedance (damp)	0.22ohm	0.25ohm	0.5ohm
Channel balance, disc, at 1kHz			0.15dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.13dB	0.13dB	0.0dB
Input data			
socket type		sensitivity	loading
Disc (mm) input		0.9mV	47kohms 115pF
Disc (mc) input*		0.059mV	200ohms 10nF
Aux/CD input		53mV	10kohms 70pF
Power amp		92mV	10kohms 1400pF
Output, pre-amp (tape)			9.3V max, 100ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, -1.4dB
Size (width, height, depth)			16x10x36cm
Typical price inc VAT			£550 + £790 (pair)

*See text



MUSICAL FIDELITY A1

MUSICAL FIDELITY LTD., UNIT 16, OLYMPIC TRADING ESTATE, FULTON ROAD, WEMBLEY HA9 0ND. TEL: 01-900 2866.

BEST BUY



1988 sees yet another look at yet another revised version of Musical Fidelity's budget amplifier. With one of the lowest output powers in the whole issue, it now costs £249, but in return sets out to offer a high standard of sound quality based on elegant circuitry, with an output stage heavily biased towards Class A operation. It lacks the full standing current required to support Class A at full power into the rated load: typically the upper 5dB of the power range was in Class A/B. But enough standing current flows continuously through the output stage to generate a lot of heat, which is dissipated by the finned top surface.

A 'straight line' design, the A1's only controls are for volume and input selection. All inputs are *via* RCA phono sockets; speaker outputs are 4mm sockets. Tape, auxiliary/tuner, CD and disc inputs are provided, and the latter may be switched for moving magnet or moving-coil sensitivities, and the relevant loadings.

The input stage uses a single ended stage with IC regulation, while the bi-polar output stage is direct-coupled complementary. The power supply is shared between channels and energised by a sizeable toroidal transformer.

After prolonged use this amplifier runs rather hot – too hot in fact to touch comfortably, and under no circumstances should it be covered: LPs melt readily on it! A thermal trip is now fitted to safeguard against overheating.

LAB REPORT

The rated output was met into 8ohms, but the level fell significantly into 4ohms, effectively to under half power here. Peak current was a modest $\pm 3.8A$, which was just sufficient for 4-8ohm speakers under peak programme conditions. At rated power, distortion levels were a satisfactory $-50dB$ or 0.3%. It was fine on intermodulation except *via* moving-coil, this result due to premature overload. Noise levels were fine while the output offset was satisfactorily low. Input overloads were fine in practice while the stereo separations were particularly good.

Channel balance was accurate and the input sensitivities were judged sensibly. The

output impedance was higher than average at a typical 0.4ohms, and this could marginally affect the tonal balance of some loudspeakers.

It performed well with respect to the 40Hz modulation tests, showing a very clean output at a modest power level. The RIAA equalisation has been improved over the original review sample, and now shows a sensible, slightly bandlimited characteristic, still a touch depressed in the treble but generally even and properly extended on both mm and m-c disc inputs.

SOUND QUALITY

Significant circuit revisions mean this is virtually a new model. The promise of sweet tonal quality, pure string tone and fine stereo heard in earlier versions have all been realised to an impressive degree, and the A1 now drives with greater dynamic authority, sharper and more stable focus, cleaner and firmer bass, plus considerably greater clarity. Stereo staging is unquestionably very good, with fine width and depth perspectives, and the treble is exceptional at anywhere near the price. Kind sounding when overdriven ultimately it is limited by its modest 20W per channel, which nonetheless goes a surprisingly long way when used with more sensitive loudspeaker systems.

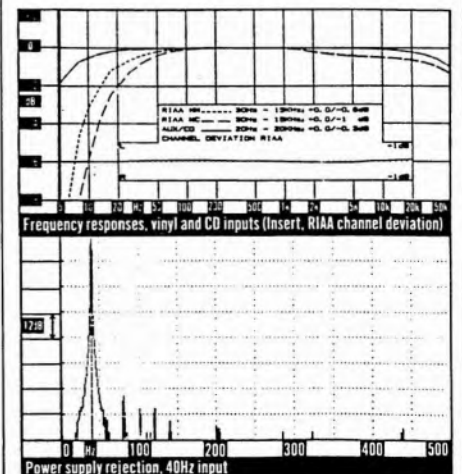
CONCLUSIONS

The A1 can now be regarded sonically as a class leader in its price group, well settled in production and benefitting from the advances also apparent in the rest of the Musical Fidelity range. It can be viewed as a smaller edition of the larger amplifiers, but not necessarily as one of impaired quality. On sound quality grounds it now clearly deserves a Best Buy rating, though the design remains sufficiently idiosyncratic particularly in terms of its excessive heat output to suggest a little caution, depending on one's domestic circumstances and/or level of enthusiasm.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		20W (= 13.5dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	13.8dBW 13.7dBW 13.5dBW		
Both channels, 4ohm load	8.7dBW 8.9dBW 8.8dBW		
One channel, 2ohms, pulsed	-dBW	8.3dBW	-dBW
Instantaneous peak current		+4.0A	-3.6A
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux/CD in.	-50.0dB -52.0dB		-50.0dB
Intermodulation, 19/20kHz, rated power, aux input			-62.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-71.9dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-26.0dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-70.0dB
Disc (mc) input (1HF, CCIR weighted)			-67.0dB
Aux/CD input (1HF, CCIR weighted)			-82.7dB
Residual, unweighted (volume control at min)			-76.2dB
DC output offset		left -26mV right 4mV	
DC offset, pre-amp		left n/a mV right n/a mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	21.6dB 29.9dB 29.8dB		
Disc (mc) input (1HF)*	25.3dB 28.6dB 23.0dB		
Aux/CD input (1HF)	>20dB >20dB >20dB		
Stereo separation			
Disc input (mm)	66.9dB* 92.8dB 65.8dB		
Aux/CD input	66.6dB* 93.3dB 68.4dB		
Output impedance (damp)	0.37ohm 0.41ohm 0.44ohm		
Channel balance, disc, at 1kHz			0.15dB
Volume/balance tracking			
Aux/CD input	0.15dB 0.12dB 1.64dB		
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.43mV	47kohms 120pF
Disc (mc) input		0.04mV	120kohms 0.20nF
Aux/CD input		23mV	46kohms 50pF
Output, pre-amp (tape)		7.5V max.	-ohms
Disc equalisation error, 30Hz-15kHz		+0dB	-2.75dB
Size (width, height, depth)			41x6.5x26cm
Typical price inc VAT			£249

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MUSICAL FIDELITY B200

MUSICAL FIDELITY LTD., UNIT 16, OLYMPIC TRADING ESTATE, FULTON ROAD, WEMBLEY HA9 0ND. TEL: 01-900 2866.

BEST BUY



The *B200* is a £300 integrated amplifier that follows Musical Fidelity's standard formula of straight-line, no nonsense design, with only essential features in evidence. The case comes from the successful *A1*, the *B200* being visually identical apart from the name on the front panel.

Like the *A1*, the *B200* has only a volume control and rotary input selector plus a separate tape monitor switch. The top of the case consists of short rounded longitudinal fins forming a heatsink; although visually attractive they act as a dust trap. The back panel inputs and speaker connections include phono sockets for disc, CD, tuner, 'aux' and tape, plus one set of 4mm sockets for speaker connection. The heatsink and side panels overlap the back panel, so access is rather restricted. But this also means that all connections are physically protected and concealed from view.

Unlike the *A1*, the *B200* is not biased heavily into class A, and is therefore claimed to be relatively cool running and capable of providing far higher power. Rated at 60W per channel into 8ohms, the amplifier uses MF's familiar complementary Hitachi MOSFET class AB output stage, preceded by a *LM318* high speed integrated circuit with carefully designed power supply.

The disc pre-amplifier stage is identical to that used in the *A100* - low noise transistors and shunt regulation, together with a FET operational amplifier - and may be gain switched to suit moving-coil or moving magnet cartridges. The power supply uses a fairly modest toroidal transformer followed by good quality smoothing capacitors.

Although the *B200* runs cooler than either the *A1* or the *A100*, it still manages to generate a fair amount of heat. When worked hard the top of the case gets distinctly warm.

LAB REPORT

Although rated at 18dBW, this unit managed a lusty 20.6dBW over the power bandwidth (one channel into 8ohms) but was marginally weaker at high frequencies. Output fell into 4ohms with both channels driven, but a respectable 17dBW was recorded on the 2ohm pulse test and the peak current of $\pm 10A$ is satisfactory for a design which in all

fairness is not intended to drive difficult loads.

While not winning any prizes distortion figures were acceptable, and the noise levels on all inputs were adequately low. DC offset was negligible and input overload margins were good. Stereo separation was fine through the midrange, falling slightly at higher frequencies but still maintaining a reasonable figure. Sensitivities were well chosen, but disc loading remained 47kohm whether set to moving magnet or moving-coil sensitivity.

The supply modulation test showed up no problems, and the RIAA equalisation displays a reasonable bass and treble rolloff plus the usual Musical Fidelity treble shelf, which is not considered serious. Channel balance was excellent.

SOUND QUALITY

Given the usual warm up (all the test amps were pre-conditioned for at least 70 minutes, and where instructed some were given 8 hours), the *B200* nonetheless gave us a very hard time. Not that we are complaining - rather, the high standard it attained complicated the ratings for so many of the other products in the issue, including some classy up-market separates. The results were very good on both vinyl and compact disc inputs, placing this model firmly in the 'budget audiophile' group. A consistent factor was the seemingly effortless power delivery - it sounded like a big amplifier with considerable reserve, good clipping characteristics and an ability to play loudly without fatigue.

The moving-coil sound was clear and detailed, well controlled and articulate throughout the frequency range. Bass lines were strong and tuneful, the mid was tonally well balanced, revealing subtle musical information, and the treble was expressive and lively with only the mildest hint of sibilance and grit. Stereo images were well formed, showing strong focus plus fine depth and width. Soundstages had a good sense of space with plenty of ambience.

The CD input sounded slightly superior, with a little extra definition, speed and focus plus a tighter bass. Here it simply sounded like a good, decently sized power amplifier.

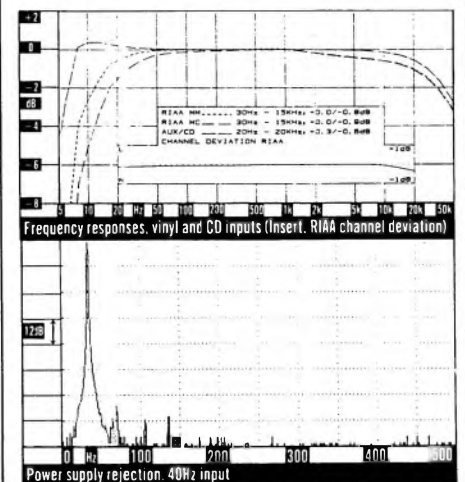
CONCLUSIONS

The *B200* is a well finished and distinctly styled integrated amplifier, simple to use and offering an ample 100W plus per channel, albeit preferring 8ohm loudspeakers. Priced at the quality end of the budget sector, it provided a musical standard of sound quality rather beyond the asking price. It could easily form the basis of a fine audio system, and handsomely qualifies for Best Buy rating.

TEST RESULTS

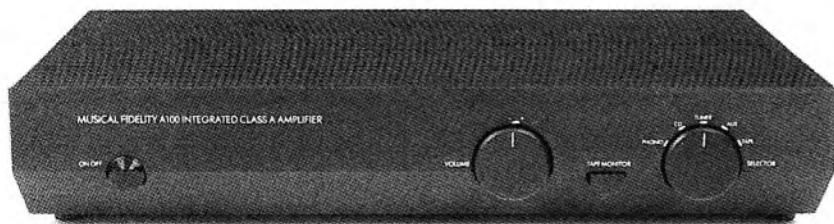
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		60W (= 18dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.8dBW	21dBW	20.5dBW
Both channels, 4ohm load	15.8dBW	16.3dBW	15.8dBW
One channel, 2ohms, pulsed	-dBW	17dBW	-dBW
Instantaneous peak current		+10A	-10A
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz
	-77dB	-65dB	-49dB
Intermodulation, 19/20kHz, rated power, aux input			-55dB
Intermodulation, 19/20kHz, at 0dB, disc (mm)			-50dB
Intermodulation, 19/20kHz, at 0dB, disc (mc)			-44dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-68dB
Disc (mc) input (1HF, CCIR weighted)			-64dB
Aux/CD input (1HF, CCIR weighted)			-70dB
Residual, unweighted (volume control at min)			-72dB
DC output offset			left 0mV, right 0.03mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	29.2dB	28.2dB	27.6dB
Disc (mc) input (1HF)*	28.6dB	26.6dB	26.5dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	72dB	68dB	47dB
Aux/CD input	80dB	69dB	49dB
Output impedance (damp)	0.06ohm	0.07ohm	0.05ohm
Channel balance, disc, at 1kHz			0.21dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.02dB	0.05dB	0.84dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.27mV	47kohms 30pF
Disc (mc) input*		0.024mV	47kohms n/a nF
Aux/CD input		18mV	44kohms n/a pF
Power amp		18mV	44kohms n/a pF
Output, pre-amp (tape)			7.5V max, 300ohms
Disc equalisation error, 30Hz-15kHz			+0dB, -0.9dB
Size (width, height, depth)			41x6x25cm
Typical price inc VAT			£299

*See text



MUSICAL FIDELITY A100

MUSICAL FIDELITY LTD., UNIT 16, OLYMPIC TRADING ESTATE, FULTON ROAD, WEMBLEY HA9 0ND. TEL: 01-900 2866.



The *A100* is an ultra-simple integrated amplifier that operates in class A over a substantial part of its dynamic range. Clearly based closely on the successful *A1*, it is only when the units are actually placed next to each other that the physical differences become apparent. Front-to-back shelf depth has been held the same, but the others have been expanded while keeping the same overall proportions – the *100* being higher and wider, not to mention heavier, with slightly more than twice the power output (50W instead of 20W), and nearly double the price (£439 instead of £239).

Highlighted by bright blue legends, the intelligently sculptured case is fabricated in ribbed black alloy to help dissipate the substantial waste heat of class A operation: on our sample the fit of these sections could have been better. A permanent internal fan further assists cooling, and this is slightly audible in quiet environments. In current production earlier thermal trip problems have been solved by matching a stable output dissipation to revised trip settings. Notwithstanding these precautions, the high case temperature remains a matter of some concern, and the amplifier should be left uncovered at all times; rumour has it that eggs will cook slowly on the top surface!

Taking minimal facilities to its logical conclusion, *A100* even eliminates the (normally rather useful) balance control in the interests of simplifying the signal path. We are left with two large knobs for volume and input selection, plus pushbuttons for power on/off and tape monitoring, all of which are a little 'clunky' in operation. Phono sockets are used on the rear, internal switching selecting mc or mm cartridge sensitivities, while 4mm sockets provide for loudspeaker connection.

LAB REPORT

This is very much an extension of the *A1* design, but with a larger heatsink area and internal (gently audible) cooling fan. With a multi-transistor complementary low-noise mc disc input (IC) and high quality shunt/series regulation particularly in pre-amp section, the power amplifier uses complementary bi-polar output transistors operating in class A at the lower end of its dynamic

range, crossing to B for the final few dB. The power supply has a toroidal transformer with substantial reservoir capacity.

The power characteristics look much more like a valve than a transistor amplifier. Meeting specification without problem into 8ohms, single channel, there was a substantial 5dBW loss into 4ohms. Peak current delivery is restricted, so this design is clearly not ideally suited to awkward or lowish impedance loudspeakers. The power supply modulation spectrogram looks a little alarming, but in fact most of the lines refer to a generally high level of simple harmonic distortion rather than mains-related spurious.

The various distortion measurements all gave poor results, though the harmonic products dropped significantly at lower drive levels. Signal-to-noise ratios and input overload margins were both quite acceptable, and stereo separation was very good. Input sensitivities should be fine, though volume/balance tracking went a little awry at low levels. The RIAA equalisation showed tight low frequency bandlimiting particularly on moving-coil.

SOUND QUALITY

The 1988 incarnation of the *A100* has been modified yet again, and showed a significant improvement in sound quality over earlier versions. Moving into the 'very good' class, the *A100* delivers a sound more normally associated with costly separates than moderately priced integrated models. Building further on the musical tonality of the *A1*, it has greater weight and authority, a more powerful and articulate bass, and a more open, clearer treble. With extra 'life' and 'drive' the stereo soundstage was well focused and showed good depth, a nice sense of space and ambience, and good stage width. As with the *A1*, however, loudspeakers below 8ohms nominal load are better avoided.

CONCLUSIONS

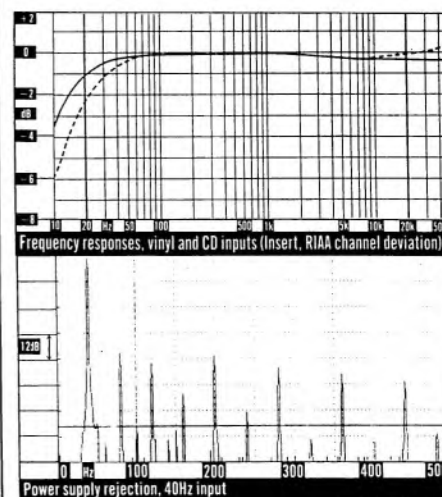
This semi-class A amplifier uniquely delivers a separates quality sound from a single box. Earlier reservations concerning bass drive and dynamics have been successfully resolved, so with a cautionary note regarding the high waste heat and the suggestion that

more awkward load loudspeakers should be avoided, this current *A100* deserves strong Recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	20Hz	1kHz	20kHz
Power output	17.8dBW	17.7dBW	17.1dBW
One channel, 8ohm load	13.4dBW	12.6dBW	12.0dBW
Both channels, 4ohm load	-dBW	12.0dBW	-dBW
One channel, 2ohms, pulsed		+6A	-6A
Instantaneous peak current			
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz
	-36dB	-35dB	-34dB
Intermodulation, 19/20kHz, rated power, aux input			-46dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-46dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-40dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-76dB
Disc (mc) input (1HF, CCIR weighted)			-68dB
Aux/CD input (1HF, CCIR weighted)			-70dB
Residual, unweighted (volume control at min)			-80dB
DC output offset	left <20mV	right <20mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	31dB	29.5dB	29.5dB
Disc (mc) input (1HF)*	34dB	27.5dB	28.5dB
Aux/CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	68dB	75dB	67dB
Aux/CD input	70dB	93dB	76dB
Output impedance (damp)	0.4ohm	0.37ohm	0.42ohm
Channel balance, disc, at 1kHz			0.04dB
Volume/balance tracking			
Aux/CD input	0dB	-20dB	-60dB
	0.3dB	0.1dB	5dB
Input data			
Disc (mm) input	Phono	0.32mV	47kohms n/a pF
Disc (mc) input*	Phono	0.027mV	47kohms n/a nF
Aux/CD input	Phono	18mV	47kohms 20pF
Output, pre-amp (tape)		3.31V max	980ohms
Disc equalisation error, 30Hz-15kHz			+0dB, -1dB
Size (width, height, depth)			44x9x25cm
Typical price inc VAT			£439

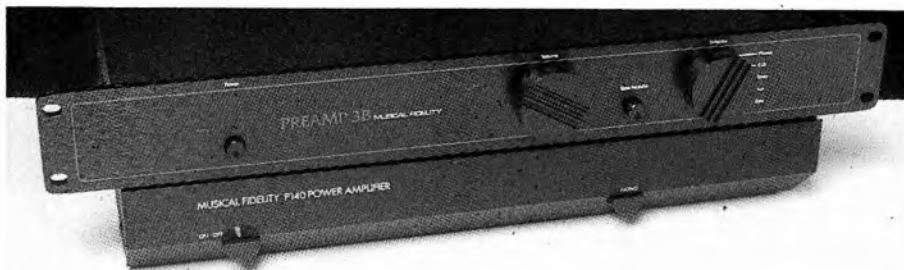
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MUSICAL FIDELITY PREAMP 3/P140

MUSICAL FIDELITY LTD., UNIT 16, OLYMPIC TRADING ESTATE, FULTON ROAD, WEMBLEY HA9 0ND. TEL: 01-900 2866.

RECOMMENDED



The first Musical Fidelity product was *The Preamp* (pronounced pre-amp), its success launching the company as a force in British hi-fi. The *Preamp 3* is its latest descendent, but now joins a large range of amplifiers, both integrated and separates. The 70W per channel *P140* is the cheapest Musical Fidelity power amp, and so forms a natural partner.

Two styles are available for the pre-amp – the 'a' packaged in the same box as the *A1* integrated amplifier, and the (more expensive) 'b' housed in a more conventional, slim-line, rack mount format. Similar innards are used in each. It is a simple, straight-line device with small remote transformer (to keep hum fields away from sensitive circuits), and with the barest of facilities available to the user. The front panel has volume control, tape monitor and on/off switches and a rotary input selector. The back panel carries high quality gold plated phono sockets for disc, CD, tuner, 'aux' and tape, plus a switch to select either moving magnet or moving-coil gain requirements. Everything is on a single printed circuit board, and good quality passive components are used throughout.

The *P140* is a MOSFET amplifier running (relatively coolly) in class AB. Construction is again on a single board. MF's generic low feedback circuit, found in several other models in the range, is based around a *LM318* gain stage, with a well regulated supply and a short input to output path. Once again good quality components are in evidence, with polypropylene coupling capacitors.

LAB REPORT

The *P140* exceeded 100W into 8ohms without problem, but output fell by 3.5dB with both channels driven into 4ohm loads. On the 2ohm pulsed test the amplifier could only muster a low 11.5dBW, partly due to a modest peak current capability of $\pm 10A$. Low impedance loudspeaker loads are obviously not ideal. Neither is this a particularly quiet amplifier; the 0dB 'A' weighted figure of -70dB is only just satisfactory.

However, channel balance, input sensitivity and loading, and DC offset were all fine. Bandwidth is sensibly rolled off at both ends of the spectrum, and there is a slight (3.5dB) boost at subsonic frequencies (peaks at 6Hz) before rolloff. The supply modulation test also gave good results.

The *Preamp 3* has very acceptable noise figures and good overload margins, albeit declining at high frequencies on disc. Very good stereo separation is seen on all inputs, but channel balance could benefit from a higher quality volume control, as the present one gives a poor performance at low volume settings. Sensitivities and loadings were all well chosen (separate pre-amplifiers are not directly comparable with output-referred integrated amplifiers on these measurements).

Harmonic distortion and intermodulation distortion performance will not win any prizes, but, as with the power amplifier, result from low negative feedback should not be subjectively significant. Output impedance was low and decreased with frequency, and the voltage offset at the output was fine. RIAA channel deviation was negligible. The response was pretty flat, rolling off outside the audio band, with the slight but now familiar MF high frequency shelf.

SOUND QUALITY

Given the price range the only significant criticism that can be levelled at the *P140* is its modest capability into adverse loads. That aside, used with normal 8ohm systems, it delivered high volumes commensurate with the lab power tests at an unqualified 'very good' standard of sound quality – in fact it was hard to believe that this was not one of the costly super amps! Genuine audiophile quality, with rich spacious stereo staging, tight dynamic bass, fine transparency and depth, plus very good focus was only slightly let down by a trace of mid hardness and glare, plus a touch of treble grain.

The *Preamp 3* came as a still greater shock, returning a still better sound quality rating, unreservedly in the top group of pre-amps and capable of partnering some really costly upmarket power amplifiers. It would appear superficially to be wildly under-priced! With only a mild softness in the bass and a slight loss of focus compared with audiophile references, the *Preamp 3* provided a highly musical and involving sound, fluid and unfatiguing, dynamic and dramatic where appropriate, resulting in deep, spacious and ambient soundstages.

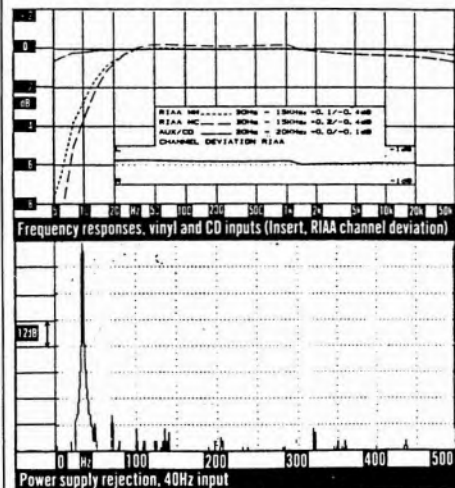
CONCLUSIONS

Both the *P140* and *Preamp 3* were of genuine audiophile standard, rather embarrassingly

so considering the modest pricing! At £600 a pair they represent a high value separates system, but several other options are also interesting. A *3* plus a pair of *P140*s could be used in double mono, bi-amped or bi-wired with appropriate speakers, to produce an impressive result at well under £1,000 the set. Taking account of our concern over avoiding difficult speaker loads, both these new products may be enthusiastically recommended.

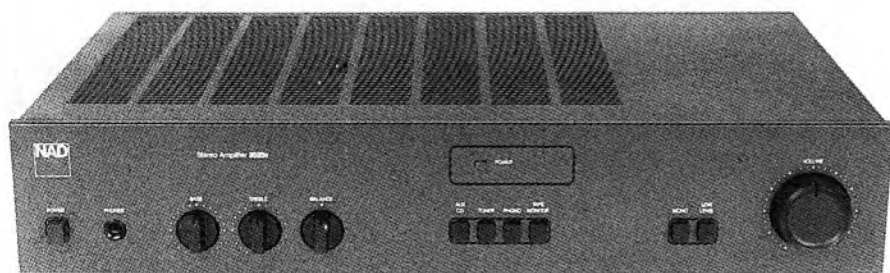
TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		70W (= 18.5dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	20.9dBW	20.9dBW	20.6dBW	
Both channels, 4ohm load	16.0dBW	16.3dBW	15.9dBW	
One channel, 2ohms, pulsed	-dBW	11.5dBW	-dBW	
Instantaneous peak current		+10A	-10A	
Distortion				
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz	
	-61dB	-61dB	-47dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-54dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-42dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-36dB	
Noise				
Disc (mm) input (1HF, CCIR weighted)			-70dB	
Disc (mc) input (1HF, CCIR weighted)			-66dB	
Aux/CD input (1HF, CCIR weighted)			-70dB	
Residual, unweighted (volume control at min)			-70dB	
DC output offset			left 7mV, right 6mV	
DC offset, pre-amp			left n/a mV, right n/a mV	
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	33.8dB	33.2dB	26.7dB	
Disc (mc) input (1HF)*	34.8dB	33.2dB	29.0dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc input (mm)	78dB	70dB	59dB	
Aux/CD input	90dB	80dB	59dB	
Output impedance (damp)	0.1ohm	0.11ohm	0.24ohm	
Channel balance, disc, at 1kHz			0.12dB	
Volume/balance tracking	0dB	-20dB	-60dB	
Aux/CD input	0.12dB	1.08dB	5.49dB	
Input data				
	sockettype	sensitivity	loading	
Disc (mm) input		2.42mV	50kohms 200pF	
Disc (mc) input*		0.267mV	50kohms 200nF	
Aux/CD input		105mV	40kohms 70pF	
Power amp		30mV	46kohms 400pF	
Output, pre-amp (tape)		9.0V max.	42ohms	
Disc equalisation error, 30Hz-15kHz		+0.2dB, -0.4dB		
Size (width, height, depth)			P140: 43.0x6.4x25/38: 48.2x5.8x24cm	
Typical price inc VAT			£299, £299	
*See text				



NAD 3020e

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



Though interim versions have risen steadily in price over the years, this *e* suffixed 3020 brings the price back down to £109 – near its original launch level of some seven years ago. The original 3020 swept all before it for a year or two until other manufacturers woke up to the fact that there was money in sound quality. The overall concept has been retained, so this is essentially the same simple, integrated amplifier which seeks to present better sound quality through the careful omission of some, but not all of the 'frills'.

It is neatly presented with a logical control layout and 'camouflage' dark brown finish to high enough standards. The single large volume control is backed by rotaries for tone and balance, with no tone defeat switching, while the seven pushbuttons, in three groups, provide power on/off, input selection including tape monitoring, plus mono/stereo and –20dB muting (the telephone answering switch). The rear panel connections are phonos, the disc input accommodating moving magnet cartridges only. Speaker terminals are (still) cheap spring-loaded types, while small switches select optimum power matching to 4ohm (normal) or 8ohm loudspeaker load, and optional 'soft clipping' circuitry the use of which is recommended to provide a sweeter sound when driving at continuous high levels.

LAB REPORT

This is the classic NAD 3020 design but with some 'streamlining' to keep costs down. Using a conventional direct coupled complementary bi-polar output configuration, component layout benefits from a single board construction, but with rather untidy wiring looping around. The circuitry is all discrete and some care has clearly been taken over bandwidth noise suppression and stage matching, but there was clearly insufficient budget available for special audiophile components. The power supply is standard enough, internal mains connections were unshrouded, and there was also some evidence of Taiwanese production economies.

Rated at only 20W, the measured power delivery was really quite generous for such a modestly priced model. It was respectably

maintained into lower impedances, and current capability was again very respectable at this price level. The quality of the power supply itself is confirmed in the excellent power supply modulation spectrogram results, where mains and distortion effects are notable for their near absence.

Distortions were all low and signal-to-noise ratios very good, as were overload margins and stereo separation results. Volume tracking calibration and input sensitivities were also fine, while the RIAA equalisation curve shows sensible bandlimiting plus slight bass cut/treble boost, sufficient perhaps to 'lighten' the subjective balance of the amplifier a trifle.

SOUND QUALITY

Rated securely above average, NAD have managed to keep the essential sonic character of the 3020 despite their production economies in this version, and it is further to their credit that this basic design has remained competitive for such a long time. The balance remains a little on the 'light and bright' side of neutral to be sure, but the result is attractively airy and quite transparent, if a trifle 'softened'. Though falling well short of the best, the stereo image presentation and the overall integration were praised, and the sound was reasonably lively, but listeners also noted some lack of 'weight', 'speed' and incisiveness.

CONCLUSIONS

NAD continue to brew a fine budget amplifier, and have also managed to keep the price sharp against the immediate competition, despite working from a design basis that is now several years old. At the typical £110 the 3020e is clearly Best Buy material, with a clean laboratory bill of health and generally high standards of construction. It has its own distinctive subjective character, a little light in balance and 'weight', so may not suit all tastes equally, but is undoubtedly superior to run of the mill budget amplifiers.

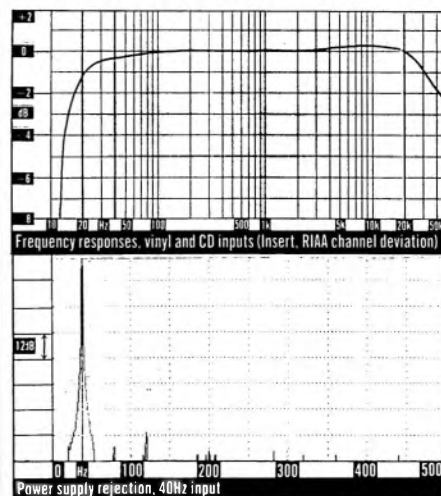
Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the

level into 4ohms and 2ohms is given in dBW (where 0db = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		20W (= 13dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.2dBW	15.7dBW	15.3dBW
Both channels, 4ohm load	11.5dBW	13.3dBW	12.7dBW
One channel, 2ohms, pulsed	–dBW	13.8dBW	–dBW
Instantaneous peak current		+12A	–11.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	–90dB	–96dB	–73dB
Intermodulation, 19/20kHz, rated power, aux input			–85dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			–72dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			–75.0dB
Aux/CD input (1HF, CCIR weighted)			–81dB
Residual, unweighted (volume control at min)			–89dB
DC output offset		left +1mV, right +2mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	34.8dB	33.7dB	32dB
Aux/CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	74dB	76dB	62dB
Aux/CD input	75dB	75dB	61dB
Output impedance (damp)	0.18ohm	0.18ohm	0.2ohm
Channel balance, disc, at 1kHz			0.13dB
Volume/balance tracking			
Aux/CD input	0.05dB	0.03dB	0.37dB
Input data			
Disc (mm) input	Phono	0.51mV	47kohms 70pF
Aux/CD input	Phono	340mV	48kohms 80pF
Output, pre-amp (tape)		15.1V max.	1.6ohms
Disc equalisation error, 30Hz–15kHz		+0.26dB,	–0.45dB
Size (width, height, depth)			42x9x28cm
Typical price inc VAT			£110



NAKAMICHI CA7E/PA7E

B&W NAKAMICHI (UK) LTD., MARLBOROUGH ROAD, CHURCHILL IND. EST., LANCING, WEST SUSSEX. TEL: (0903) 750750.



Nakamichi's remote control CA-7A pre-amplifier also acts as central controller for other Nakamichi products such as tuner, CD player and two tape decks. The styling is conventional, with a high quality satin-black case constructed from aluminium castings, and with internally damped panels. The heavy satin-black PA7E power amplifier has deep finned heatsinks covering either side: inset carrying handles are thoughtfully provided.

The back panel has three separate gain settings for the MC input and three capacitance loading selections for the MM input. Other phono socket inputs are provided for tuner, CD, 2X 'aux', 2X tape and there are 2 outputs. There are also DIN sockets for remote control inputs and outputs, a remote sensor and a system power control.

Internal construction is to a very high standard, using several printed circuit boards with a mixture of operational amplifier and discrete transistor stages. Power is supplied from two cased transformers and even the fuse holders are gold plated.

The power amplifier has excellent external finish, the case constructed from aluminium panels. A look inside reveals double mono circuitry fed from a large, shared toroidal transformer. Separate bridge rectifiers feed 2 pairs of high quality centrally mounted Nichicon 33,000µF capacitors. Components are discrete with banks of complementary output transistors for each channel. Important non-soldered connections use gold plated screws and terminals, and the general standard of construction is high.

LAB REPORT

This power amplifier exceeded specification by a fair margin, providing nearly 25dBW (300W+) into 8ohms. 23dBW was also surpassed into 4ohms, and nearly 25dBW was again recorded into 2ohms, but with some asymmetry, the positive pulse showing some early breakup. The peak current test gave problems with a recovery 'glitch', and the figure for a clean waveform is a modest 21A. Channel separation and balance was excel-

lent, and distortion and signal-to-noise ratios were good. Input sensitivity was fairly low and input impedance quite high. The frequency response was essentially flat and gently band-limited outside the audio spectrum.

The pre-amplifier showed low distortion and good overload performance on all inputs. Stereo separation was exceptional, and channel balance very good. Sensitivities were fine on the line inputs but had a fairly low 14kohm loading. The gain of the moving magnet disc stage was well chosen with various capacitance loading options. The moving-coil stage has a fixed load but well chosen alternative gain settings which should negate matching problems. RIAA channel deviation was negligible and the frequency response virtually flat over the 20Hz to 20kHz bandwidth. However, both disc inputs exhibited a mild but untamed ultrasonic rise.

SOUND QUALITY

These two products were quite well matched sonically. As a system they rated 'good plus', which is a respectable though somewhat uninspiring result at this price and level of sophistication. Auditioned alone, the power amp possessed some of that mainstream 'processed', 'electronic' quality in the mid and low treble. Although clearly powerful, the bass was lacking a full measure of slam and speed. The midrange showed some 'leaness', the treble some 'zing'. Focus was certainly good, but depth rated only above average. Taken overall the sound was lively enough, but not really good enough in this context.

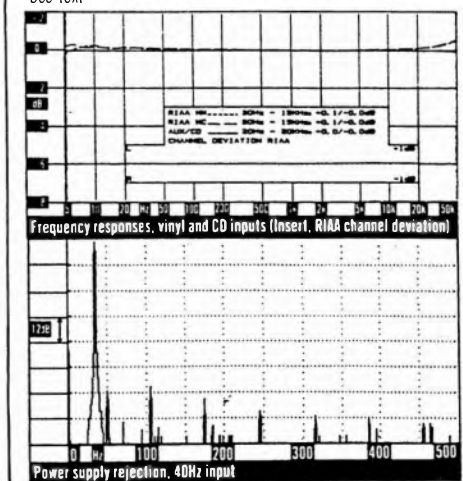
The preamplifier alone had better bass on both analogue and digital disc inputs. Described as sharp and snappy, this was possibly due to the fast but 'hardened' midrange which tended to exaggerate the impact of mid and bass transients. Soundstages were wide and well focused, but with insufficient depth. The generally tidy treble had the same trace of 'sszz' noted with the power amplifier. No significant merit difference was detected between the m-c cartridge and CD inputs.

CONCLUSIONS

While better than previous Nakamichis, and no doubt also better than many of its similarly equipped competitors, this sophisticated combination did not achieve a particularly good value rating based on sound quality alone. However, the standard was respectable, the build and finish quality are exemplary, and the multitude of automated features could prove useful in some applications. On this basis it may be worth investigating, but not for formal Recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	200W (= 23dBW)		
Power output	20Hz 1kHz	20kHz	
One channel, 8ohm load	25.0dBW	25.1dBW	24.8dBW
Both channels, 4ohm load	23.7dBW	23.8dBW	23.7dBW
One channel, 2ohms, pulsed	-dBW	24.8dBW	-dBW
Instantaneous peak current		+22A	-21A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-73dB	-75dB	-72dB
Intermodulation, 19/20kHz, rated power, aux input			-87dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-75dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-65dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-83dB
Disc (mc) input (1HF, CCIR weighted)			-73dB
Aux/CD input (1HF, CCIR weighted)			-83dB
Residual, unweighted (volume control at min)			-83dB
DC output offset		left 0mV, right 0mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	36.7dB	36.2dB	35.0dB
Disc (mc) input (1HF)*	33.3dB	32.7dB	26.0dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	95dB	96dB	88dB
Aux/CD input	95dB	96dB	92dB
Output impedance (damp)	0.12ohm	0.13ohm	0.13ohm
Channel balance, disc, at 1kHz			0.55dB
Volume/balance tracking			
Aux/CD input	0dB	-20dB	-60dB
Aux/CD input	0.02dB	0.55dB	1.08dB
Input data			
Disc (mm) input	Phono	sensitivity 0.64mV	loading 50kohms var pF
Disc (mc) input*	Phono	0.042mV	100kohms n/a nF
Aux/CD input	Phono	40mV	14kohms 100pF
Power amp	Phono	135mV	77kohms 350pF
Output, pre-amp (tape)			8.2V max. 1kohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, -0.0dB
Size (width, height, depth)			PA7E 43.5x20x42.1cm CA7E 43.4x9.1x35cm
Typical price inc VAT			£2,500, £1,700
*See text			



NIKKO NA700 II

NIKKO UK, 150 REGENT STREET, LONDON W1R 5FA. TEL: (01) 439 6288.



Nikko are a Japanese brand returning to the UK hi-fi separates market after a few years absence. The NA700 is totally conventional, almost old fashioned, in styling, concept and execution, but offers reasonable value for money when judged in terms of facilities and specifications. The 700 is rated at 57W per channel into 8ohms but is only specified at 65W into 4ohms, which doesn't indicate a particularly high current capability. Rather what is offered is a competently constructed amplifier with an ample array of facilities.

The well finished front panel carries bass, treble, balance, and volume controls, subsonic and high cut filters, the switching of two sets of loudspeakers and a headphone socket. Neither tone-defeat nor 'CD direct' are provided, but there is even a separate LED power level indicator for each channel. The input selector and tape monitor use pushbuttons.

The rear panel has two sets of (barely adequate) speaker binding posts, and the standard array of phono input sockets. These cater for disc (which can be switched between moving magnet and moving-coil), tuner, 'aux', and two tape decks. A solitary DIN socket is also provided for tape recorder connection.

Internally, a large single board carries all the active audio circuits. A single transformer feeds a pair of 10,000µF capacitors located on the main board. The circuits themselves are a mixture of integrated circuits and discrete passive and active components, of standard commercial quality. The output stage transistors are bolted to an internal heatsink, and protection uses relay switching. Some remote switching is used in the low amplitude signal path, but there are no high grade 'audiophile' components.

LAB REPORT

The amplifier easily and convincingly exceeded its specified rating into 8ohms; though there was a substantial loss of some 4dBW into 4ohms, (still within specification). Peak current delivery is restricted to ±6A before the waveform started to break up, which does not provide much reserve for more difficult loads. This is well demonstrated by the single channel, 2ohm, pulsed power result. Distortion generally was low,

and signal-to-noise ratios were satisfactory. DC offset was a little too high at the power amplifier output: 111mV on the left channel is enough to displace speaker cones by a significant amount.

Input overload and stereo separation were satisfactory on all inputs, and the output impedance was low. Sensitivities were well chosen, but add the 250pF capacitance loading on the moving magnet input to a typical 100pF for tonearm cable and the result may be a little high for some cartridges. Channel balance was good throughout the range of the volume control and the RIAA channel balance is also commendable.

The RIAA frequency response is accurate, and all inputs are rolled off at high frequencies. At the bass end the moving magnet and line input responses are well extended to below 5Hz, whereas the moving-coil response falls (sensibly) below 20Hz. The 40Hz two-thirds power spectrum delivered a good result.

SOUND QUALITY

Regrettably, the first Nikko amplifier to be reviewed in *Choice* for a long while did not fare well in the listening tests. It scored consistently below average on all inputs, sounding much as integrated amplifiers used to do in years gone by, before their designers really started trying.

On the moving-coil input, the bass sounded soft and inarticulate, with a noticeable lack of slam and dynamics. The mid appeared coloured, with a nasal, 'thickened' quality and some muddling of detail. In the treble those old bogies 'slurring', 'sibilance', and 'grain' were all in evidence. Stereo depth was severely curtailed, focus was diluted, and the overall effect a bit 'mono-ish', lacking scale and width.

The 700 continued to sound confused and compressed via the CD input. The mid coloration was singled out as a megaphonic, near 'ringing' effect, and the bass remained well below par. Overall definition was considered marginally improved.

Driven hard, the amplifier did not take kindly to adverse speaker loads. The full loudness potential was not comfortably exploited, as the sound became brittle and aggressive as full power was reached.

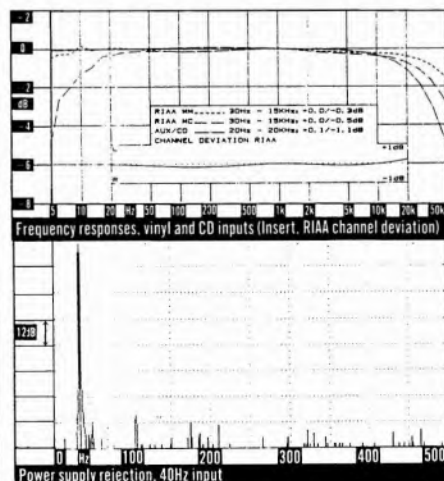
CONCLUSIONS

Frankly, we didn't realise they still made amplifiers like this any more. In our opinion the 700 is a perfect example of an essentially correct 'text-book' design that delivers good lab results (except for peak current delivery, which probably hasn't reached the book yet anyway), but which sounded quite indifferent. The new Nikko team may have a well priced range, but higher sound quality standards will be needed to make a real impression on the UK amplifier market.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		57W (= 17.5dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.9dBW	20dBW	19.9dBW
Both channels, 4ohm load	15.8dBW	15.8dBW	15.7dBW
One channel, 2ohms, pulsed	-dBW	11.5dBW	-dBW
Instantaneous peak current		+6A	-6A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-83dB	-84dB	-80dB
Intermodulation, 19/20kHz, rated power, aux input			-84dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-77dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-70dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-70dB
Disc (mc) input (1HF, CCIR weighted)			-64dB
Aux/CD input (1HF, CCIR weighted)			-71dB
Residual, unweighted (volume control at min)			-82dB
DC output offset		left 111mV, right 67mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	31.7dB	30.9dB	27.6dB
Disc (mc) input (1HF)*	32.2dB	31.0dB	27.8dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	60dB	54dB	37dB
Aux/CD input	67dB	54dB	41dB
Output impedance (damp)	0.15ohm	0.15ohm	0.21ohm
Channel balance, disc, at 1kHz			0.2dB
Volume/balance tracking			
Aux/CD input	0dB	-20dB	-60dB
Input (1HF)	0.07dB	0.03dB	0.46dB
Input (1HF)			
Disc (mm) input	Phono	0.32mV	47kohms 280pF
Disc (mc) input*	Phono	0.032mV	100kohms n/a nF
Aux/CD input	Phono	18.9mV	39kohms 170pF
Power amp	n/a	n/a mV	n/a kohms n/a pF
Output, pre-amp (tape)			10.4V max, 2.2kohms
Disc equalisation error, 30Hz-15kHz			+0.0dB, -0.5dB
Size (width, height, depth)			44x9.6x33cm
Typical price inc VAT			£189

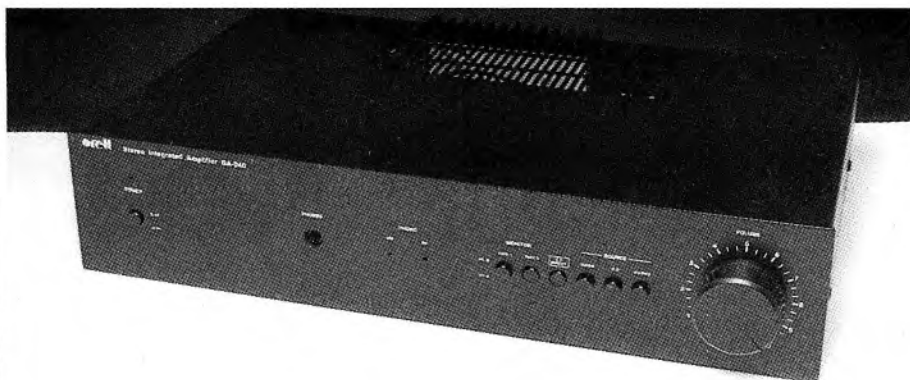
*See text



ORELL SA-040

ORELL ELECTRONICS LTD., 25 NATHANS ROAD, NORTH WEMBLEY, MIDDLESEX. TEL: (01) 908 5890.

RECOMMENDED



Orell is a new company launching its first product in early 1988 – an integrated amplifier with design input from Graham Nalty of Audiokits. The unit supplied for review was a pre-production prototype, but we have been assured that production samples will sound and measure the same as ours, and that construction and finish will be to a high standard.

The 040 is a 'purist' design lacking any form of tone control or other user interactive signal shaping circuitry. The front panel has only a volume control, on/off switch, a row of push button selector switches, and two centrally located LEDs to indicate either moving magnet or moving-coil phono gain setting. CD or 'CD direct' options are alongside phono, aux, tuner and tapes: 'CD direct' links the CD input straight to the volume control, so gain here is low. The back panel has a small finned heatsink, phono inputs and the speaker outputs.

A look inside reveals a large single glass-fibre printed circuit board with pre- and power sections physically well separated. Care has been taken over selection of components in the signal path. Precision resistors are used in selected places, and good quality polypropylene caps are much in evidence.

Power supply comes from a sizeable toroidal transformer feeding good quality 10,000µF electrolytics, while the output is protected by fuses in the speaker lines. Good quality regulators provide each important stage with its own supply. Build quality reflects this units prototype status; hopefully there will be an improvement in production.

LAB REPORT

Power output met the specified 45W per channel with good bandwidth, holding up well both into 4ohms with both channels driven, and on the one channel 2ohm pulsed test. The slightly asymmetric peak current capability is just about adequate; higher currents were available with some waveform break up. Total harmonic and intermodulation distortion results were decent, and noise performance on all inputs adequate. Channel

separation was fine at low and mid frequencies but had fallen to 35dB by 20kHz.

Sensitivities were a little on the low side but the loadings were well chosen. Little mains harmonic breakthrough can be seen on the supply modulation spectrogram, though some harmonic distortion artefacts are visible. The RIAA response was well designed: essentially flat and with the mild bass rolloff also found on the line inputs.

Input overload was generally satisfactory on the moving magnet gain setting, but intermodulation could have been improved upon. The overload margins were a little disappointing on the moving coil setting, the -15dB intermodulation products indicating that cartridge output must be chosen with some care to match the input sensitivity.

SOUND QUALITY

Our pre-production sample delivered solid 'good plus' ratings *via* both analogue and digital disc input terminals. By implication the moving-coil input is sufficiently good not to prejudice an overall result which is close to the standard set by established high performers in this price group – a promising debut for a new company with their first product!

The m-c input background noise levels were satisfactory and the midrange had a pleasant, well balanced tonal quality, with good detail. The well above average bass had decent rhythm and speed, but a somewhat dry and light balance. The treble achieved a good standard with only mild grit, while stereo imaging had worthwhile depth and ambience with strong stable focus. Louder and more complex passages showed some confusion and mid hardness.

The CD/line input standard was consistent, with only a slight improvement in definition and focus. The overall sound was a little filtered or bandlimited – a subjective effect often associated with frequency responses tightly tailored to the nominal audio bandwidth. High level drive was the one weakspot. Clipping performance was poorer than average, brittleness increasing rapidly at full level, and available loudness

was no higher than the specification suggested.

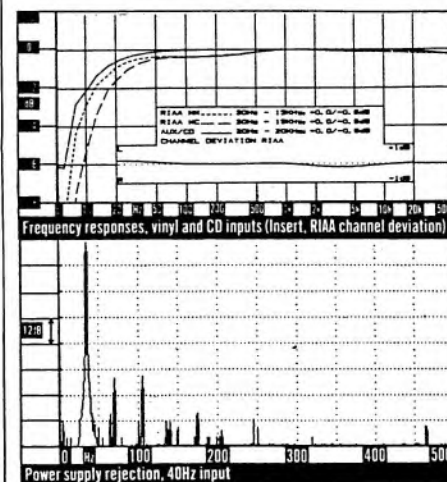
CONCLUSIONS

This is a promising start for Orell, confirming the basic quality of the design groundwork in circuitry and component choice. The sound quality as is clearly achieves a Recommended standard, though full approval must await inspection of a final production sample. Peak output current and greater m-c disc overload margin could both be improved.

TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		45W (= 16.5dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	17.2dBW	17.2dBW	17dBW	
Both channels, 4ohm load	15.35dBW	15.85dBW	15.7dBW	
One channel, 2ohms, pulsed	-dBW	15.5dBW	-dBW	
Instantaneous peak current		+10A	-8A	
Distortion				
Total harmonic distortion, at rated power, aux/CD in.	20Hz	1kHz	20kHz	
	-65dB	-65dB	-52dB	
Intermodulation, 19/20kHz, rated power, aux input			-56dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-23dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-15dB	
Noise				
Disc (mm) input (1HF, CCIR weighted)				-66dB
Disc (mc) input (1HF, CCIR weighted)				-62dB
Aux/CD input (1HF, CCIR weighted)				-72dB
Residual, unweighted (volume control at min)				-75dB
DC output offset				left 3mV, right 4mV
DC offset, pre-amp				left 0mV, right 0mV
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	27.7dB	24.5dB	15.3dB	
Disc (mc) input (1HF)	22.4dB	16.8dB	7.6dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc input (mm)	64dB	67dB	48dB	
Aux/CD input	76dB	60dB	35dB	
Output impedance (damp)	0.073ohm	0.08ohm	0.1ohm	
Channel balance, disc, at 1kHz				0.5dB
Volume/balance tracking	0dB	-20dB	-60dB	
Aux/CD input	0.09dB	0.23dB	0.46dB	
Input data				
Disc (mm) input	socket type	sensitivity	loading	
		0.78mV	49kohms	120pF
Disc (mc) input*		0.28mV	100ohms	n/a nF
Aux/CD input		100mV	30kohms	n/a pF
Power amp	n/a	n/a mV	n/a kohms	n/a pF
Output, pre-amp (tape)			3.7V max.	2.2kohms
Disc equalisation error, 30Hz-15kHz			+0.0dB, -0.6dB	
Size (width, height, depth)			43.2x9.2x33cm	
Typical price inc VAT				£359

*See text



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99

PHILIPS FA860

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



While the Philips name has been firmly re-established within hi-fi circles by their very competitive CD players, the company has only just announced a range of matching separates, including the amplifier reviewed here. Made in Japan, the 860 bears most of the design and build hallmarks we have come to expect from that country.

The case is well made, with modern styling that may not win many prizes but will offend few. Capitalising on their CD success, Philips provide a 'CD direct' facility that draws attention to itself by illuminating a slightly exaggerated CD front panel marker. Other push-button selections denoted by small LEDs include phono, CD, TV/aux 1, video/aux 2, and 2Xtape. Headphones, A/B speaker switching, loudness, mono, tape monitor and copy facilities, bass, treble and balance controls plus a large backlit volume control make up a comprehensive complement. Input connections use phono sockets, loudspeakers have two sets of decent binding posts.

The interior is well laid out with the power amplifier situated between two internal heatsinks. A single, good sized transformer supplies a power amplifier of basically dual mono configuration but with a shared thick film pre stage. The rest of the amplifier is made up of several separate printed circuit boards connected by a commendably neat wiring harness. Circuits are a mixture of discrete and integrated circuit active elements, with passive components mainly of standard commercial quality. However, a good quality Alps volume control is used together with remote switching, and both CD and disc inputs have gold plated phono sockets.

LAB REPORT

Output power was handsomely exceeded into 8ohms, with good bandwidth. However, power was somewhat restricted at low frequencies into 4ohms, though well enough maintained at mid and high frequencies.

Waveform breakup started at 15dBW into 2ohms on the pulsed test, but this was fairly slight and 19dBW was ultimately available.

Total harmonic distortion was very low in the low and mid frequency bands, deteriorat-

ing marginally at 20kHz. Intermodulation distortion and noise figures are good on all inputs, and DC output offset was kept low.

Input overload margins were very good on all inputs, and stereo separation was well maintained at all frequencies. Output impedance was low and channel balance very good - volume/balance tracking was quite exceptional, especially at low settings. Input sensitivities were well chosen on all inputs, and loadings were fairly standard apart from rather high capacitance loading on the moving magnet input, sufficient to give one or two cartridges a 'dulled' treble. Tape output was healthy, from a fairly low 220ohm source impedance. The power supply modulation spectrogram is fairly clean, with little ripple breakthrough.

The RIAA frequency response shows bass rolloff on both disc inputs, starting at 100Hz and -4dB at 20Hz. The moving magnet response is fairly flat and well extended at the treble end, whereas the moving-coil input has a slight rolloff. The 'aux'/CD response is fairly flat and well extended.

SOUND QUALITY

Straightforward and competent, the FA860 sounded better than average for its type but did not establish any new records. The result was better on compact than analogue disc, but the difference between the two was not excessive. Taken overall it was placed a touch below its larger 960 brother, consistent with the relative pricing and specifications.

Driven from a top quality moving-coil source, the 860 sounded relaxed and powerful - pleasantly neutral if rather bland. Musical dynamics were muted, a loss of precise focus was noted, and the depth impression was rather average. Vaguer than the best examples of its type at the frequency extremes, treble was diffuse and mildly fizzy.

CD showed some improvement, with a fuller and more generous sound. Bass went deeper with more articulation and better 'tunes'. More open sounding, the stereo image showed a little more depth, space and focus. Good sound levels were attained when driven hard, even on the more awkward loudspeaker loadings, and it did not become

unduly brittle or aggressive at clipping overload.

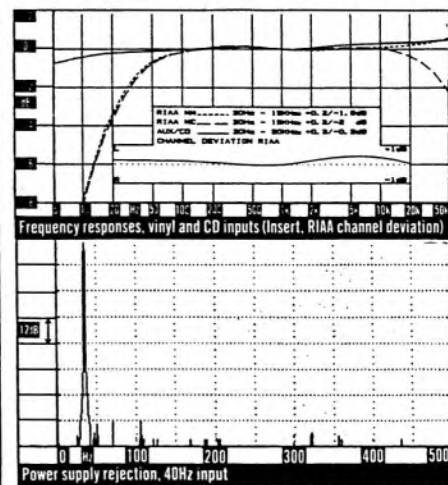
CONCLUSIONS

This competent amplifier provided a well founded lab performance and a respectable but undistinguished sound. It was well built, to a high specification, offering a generous power output, and as such merits consideration.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		70W (= 18.5dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.4dBW	20.8dBW	20.6dBW
Both channels, 4ohm load	17.8dBW	18.8dBW	18.5dBW
One channel, 2ohms, pulsed	-dBW	15dBW	-dBW
Instantaneous peak current		+24A	-22A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-87dB	-90dB	-78dB
Intermodulation, 19/20kHz, rated power, aux input			-82dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-78dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-72dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-78dB
Disc (mc) input (1HF, CCIR weighted)			-65dB
Aux/CD input (1HF, CCIR weighted)			-83dB
Residual, unweighted (volume control at min)			-94dB
DC output offset		left 8mV, right 10mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	35.8dB	31.6dB	31.2dB
Disc (mc) input (1HF)	36.7dB	32.5dB	32.4dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	83dB	79dB	60dB
Aux/CD input	79dB	85dB	60dB
Output impedance (damp)	0.12ohm	0.12ohm	0.14ohm
Channel balance, disc, at 1kHz			0.28dB
Volume/balance tracking			
Aux/CD input	0.31dB	0.08dB	0.0dB
Input data			
Disc (mm) input	socket type	sensitivity	loading
Disc (mc) input*		0.33mV	47kohms
Aux/CD input		0.034mV	100ohms
Output, pre-amp (tape)		21.5mV	24kohms
Disc equalisation error, 30Hz-15kHz			11.5V max, 220ohms
Size (width, height, depth)			+0.2dB, -2.0dB
Typical price inc VAT			42x13x37.5cm
			£239

*See text



PHILIPS FA-960

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



The new range of Philips integrated amplifiers is sourced in Japan, and consequently reflects some of the design philosophy and style associated with that country's products. Being at the top of the range, the FA-960 is highly specified with numerous features. The case is well finished, and the styling modern and functional.

This amplifier is rated at 100W (20dBW), with plenty of power to drive lower impedance loads shown in a DIN rating of 280W into 2ohms at 1kHz. Front panel controls include disc input selection (mm and m-c), plus provision for CD, 'CD direct', tuner, two 'aux' inputs, and two tape decks. Also provided are tone controls, loudness, tone defeat, mono switching, various tape monitor and dubbing features, balance, speaker switching and a headphone output. The back panel has phono sockets (gold plated for the cartridge input) and 2 sets of speaker binding posts.

A look at the interior shows modern multi-board design and construction with some good audio engineering practice. The disc input uses now familiar low noise FETs with the gain stage built around a standard operational amplifier. Good quality potentiometers and remote switching is used in the pre-amp stage. The power amplifier is centrally located and is basically dual mono in design but sharing a single printed circuit board and large power transformer. The four 6,800µF main reservoir capacitors are centrally located on the main board and the output is relay protected.

LAB REPORT

Power output peaked at 160W (22dBW) into 8ohms, easily exceeding specification. The output remained healthy into 4ohms and achieved a very creditable 20dBW on the 2ohm pulsed test. Satisfactory peak currents of ±20A indicate the amplifier should be capable of driving difficult loads quite well.

Noise figures were fine on all inputs. DC offset and total harmonic distortion were both low, and the intermodulation distortion figures were still acceptable, though higher than expected. Disc overload margins were good on both the moving magnet and the moving-coil sensitivity settings. Stereo

separation and volume/balance tracking were good, while sensitivities were on the high side. The 430pF input capacitance on the moving magnet disc input is perhaps a little too high for some cartridges. The tape output was unclipped at 10V maximum, with output impedance of only 220ohms.

The moving-coil and moving magnet disc inputs show near identical responses over the audio bandwidth: virtually ideal over the 100Hz to 20kHz bandwidth, the bass was rolled off surprisingly early, being -2dB by 30Hz. However, the moving magnet setting showed a rising trend above 20kHz which could have been better controlled. The power spectrogram shows a good quality supply, with excellent resistance to 50Hz harmonic breakthrough.

SOUND QUALITY

Showing a small but significant improvement over its smaller 860 brother, the FA960 achieved a respectable enough score in the listening tests considering its operational flexibility and versatile facilities. Rating 'good' *via* m-c and a little better *via* CD direct, with all filters, tone controls etc. defeated, it offered an inherently relaxed and easy character, with a pleasant midrange and a capability of producing a large scale, generous sound with considerable reserves of power.

Auditioned through the disc inputs, the bass showed some softness, with a lack of punch or speed which was a little more serious *via* m-c. Never unpleasant, the treble had a degree of haziness and untidiness, but focus could have been more sharply defined, mid clarity likewise. CD's moderate improvement involved some increase in dynamic power and clarity, though the bass remained similarly softened. Taken overall, stereo depth was rated above average.

CONCLUSIONS

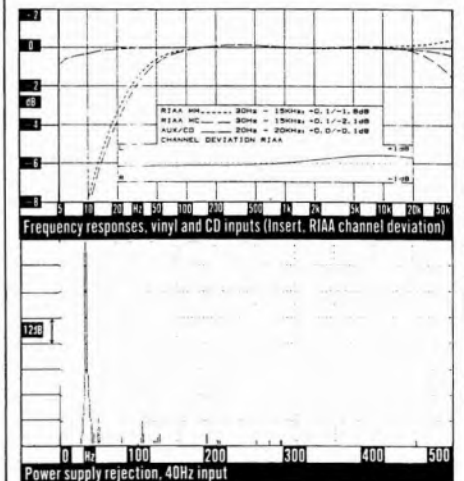
A thoroughly modern integrated amplifier with excellent finish and very good build quality, the FA960 provided high output powers and was respectably load tolerant, with a fine and well balanced lab performance. The sound quality rating was creditable enough, albeit lagging the specialist products which prize that above all else. Taking all factors

into account this new amplifier merits serious consideration.

TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		100W (= 20dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, Bohm load	21.8dBW	22.1dBW	21.9dBW	
Both channels, 4ohm load	19.9dBW	20.7dBW	20.4dBW	
One channel, 2ohms, pulsed	-dBW	20dBW	-dBW	
Instantaneous peak current		+20A	-20A	
Distortion				
Total harmonic distortion,	20Hz	1kHz	20kHz	
at rated power, aux/CD in.	-81dB	-83dB	-78dB	
Intermodulation, 19/20kHz, rated power, aux input			-80dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-76dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-54dB	
Noise				
Disc (mm) input (1HF, CCIR weighted)			-76dB	
Disc (mc) input (1HF, CCIR weighted)			-65dB	
Aux/CD input (1HF, CCIR weighted)			-83dB	
Residual, unweighted (volume control at min)			-94dB	
DC output offset			left 8mV, right 11mV	
DC offset, pre-amp			left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	35.6dB	31.7dB	30.2dB	
Disc (mc) input (1HF)*	36.7dB	32.3dB	30.8dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc input (mm)	76dB	80dB	59dB	
Aux/CD input	77dB	81dB	61dB	
Output impedance (damp)	0.12ohm	0.12ohm	0.14ohm	
Channel balance, disc, at 1kHz			0.2dB	
Volume/balance tracking				
Aux/CD input		0.06dB	0.36dB	0.17dB
Input data		socket type	sensitivity	loading
Disc (mm) input			0.257mV	46kohms 430pF
Disc (mc) input*			0.03mV	100ohms n/a nF
Aux/CD input			15mV	22kohms 120pF
Power amp	n/a	n/a mV	n/a kohms	n/a pF
Output, pre-amp (tape)			11.5V max, 220ohms	
Disc equalisation error, 30Hz-15kHz			+0.1dB, -2.1dB	
Size (width, height, depth)			42x15.8x38.0cm	
Typical price inc VAT			£284	

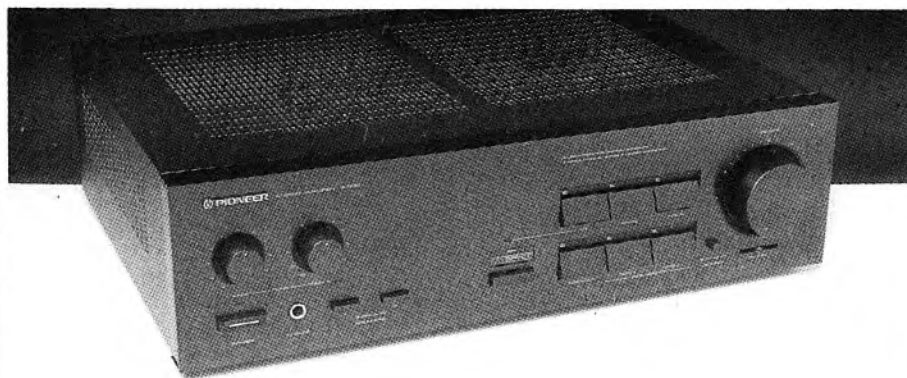
*See text



PIONEER A331

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

RECOMMENDED



The 331 is rated at 40W per channel into 8ohms, but claimed good current capability should well drive lower impedance loudspeakers without trouble. The simple styling and clean lines are ergonomically well thought out and entirely modern. Bass, treble and loudness facilities are provided but may be bypassed if 'CD direct' is chosen. The input selector and tape monitor are push buttons, the balance a slider under the large volume knob at the right of the front panel. A headphone socket is also available. The back panel has phono inputs for CD, vinyl disc (moving magnet only), tuner and 'aux' plus provision for two tape recorders. The two switchable sets of spring-loaded speaker terminals allow quick connection of bared wires.

Construction is competently typical of Japanese mass production techniques. The solid steel case is well tolerated and nicely finished. Plastic knobs and buttons adorn the front panel, and there is no sign of gold plating on the phono sockets, but copper plated screws have been used to fix the lot together. The multi-board internal construction has interconnections by neatly routed ribbon cable.

The power amplifier uses discrete transistors while the pre-amplifier and tone controls are constructed around integrated circuits. The power supply is fairly substantial with two 6,800µF reservoir capacitors. Most passive components are of commercial grade but one or two higher quality capacitors may be found in the more important places.

LAB REPORT

This unit happily exceeded its 16dBW specification, delivering a healthy 18dBW (63W) over the 8ohm power bandwidth. Continuous delivery with both channels driven into 4ohms was also good, and the +14A/-12A peak current was quite generous; difficult loads should be driven without too much trouble. Both harmonic and intermodulation distortion results were very good, DC offset was satisfactory, and the recorded noise figures were low. Disc and auxiliary input overload margins were fine, and channel separation was reasonably good. Channel

balance was fine on all inputs and well maintained over a range of volume control settings.

Output impedance was almost negligible and the input sensitivities and loadings measured as expected. Some hum harmonics were visible in the power spectrogram, but these were kept to a moderate level. The CD response was only flat up to 5kHz, whence surprisingly it was rolled off, being -1dB at 20kHz. Note that the CD input capacitance was quite high. The RIAA response was fairly flat and well extended, measuring within reasonable ± 0.3 dB limits between 30Hz and 15kHz.

SOUND QUALITY

Pioneer are another manufacturer who are now taking sound quality rather more seriously than before. The A331 represents the first *Choice* trial of this new policy, which would seem to have been effective, placing this budget model in the 'above average' class for sound quality.

Modestly successful on the chosen tracks, the 331 has a respectably 'boppy' and tuneful bass, fair dynamics, quite good focus and a natural sounding midrange. The treble was classed as average with mild sibilance and grain, but a good standard of stereo focus was maintained.

The essential character was relaxed and pleasant - not too clear or explicit, but easy on the ears, which is an important factor in my view. This quality was maintained *via* CD, which continued to sound a trifle subdued with the musical energy a little damped down. Small improvements in stereo focus, bass definition and depth were noted, but without significant uplift in mid clarity or treble definition. A clean performer at overload when driven hard, consequently it could play pretty loud, and adverse loads were well handled.

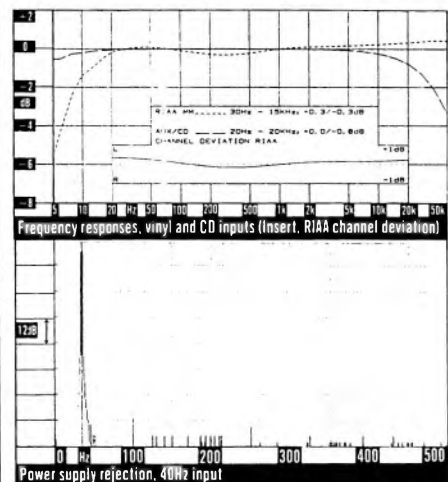
CONCLUSIONS

Representing a substantial improvement over similar but earlier Pioneer offerings, the A331 represents a serious attempt to win back the hearts of the budget- but quality-minded British consumer. Scoring above

average on all departments at a below average price, it has done well enough to move quietly into the Recommended category.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		40W (= 16dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	17.95dBW 18.3dBW 18.1dBW		
Both channels, 4ohm load	15.7dBW 16.1dBW 15.9dBW		
One channel, 2ohms, pulsed	-dBW 13.5dBW -dBW		
Instantaneous peak current	+14A -12A		
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz 1kHz 20kHz		
	-82dB -84dB -77dB		
Intermodulation, 19/20kHz, rated power, aux input		-68dB	
Intermodulation, 19/20kHz, at 0dBW, disc (mm)		-85dB	
Noise			
Disc (mm) input (1HF, CCIR weighted)		-70dB	
Aux/CD input (1HF, CCIR weighted)		-74dB	
Residual, unweighted (volume control at min)		-78dB	
DC output offset		left 8mV, right 14mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	31.8dB 31.1dB 27.5dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	79dB 69dB 48dB		
Aux/CD input	81dB 71dB 50dB		
Output impedance (damp)	0.12ohm 0.12ohm 0.16ohm		
Channel balance, disc, at 1kHz		0.1dB	
Volume/balance tracking	0dB -20dB -60dB		
Aux/CD input	0.05dB 0.25dB 1.02dB		
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.41mV	47kohms 135pF
Aux/CD input		25.3mV	50kohms 760pF
Output, pre-amp (tape)		10.4V max, 2.7kohms	
Disc equalisation error, 30Hz-15kHz		+0.3dB, -0.3dB	
Size (width, height, depth)		42x12x31.7cm	
Typical price inc VAT		£150	



QED A240 SA II/A240 CD II

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



Retaining the 240 designation, closer inspection reveals this amplifier is a substantial redesign. The SA is the more expensive, and comes complete with a high quality moving magnet/moving-coil input module; the economy CD model has a simpler moving magnet input, but is otherwise the same.

Styling is neat, clean and conventional with a good quality all aluminium case. The front panel has three rotary controls which adjust volume/balance and input to listen and output to record. Available selections on both are disc, CD, tuner, video, tape, and DAT. A headphone socket is also provided amongst the phono sockets on the back panel. Where appropriate moving-coil or moving magnet are set by internal switches. Six 4mm sockets for loudspeaker connections allow optional automatic headphone muting.

Build and finish quality is high both inside and out. A substantial and very quiet toroidal transformer feeds on-board 4,700 μ F power supply capacitors. The class AB power amplifier uses discrete components and direct or switched output coupling. It has fairly high gain, so line level inputs are fed directly to the volume control, minimising the signal path. The SA disc input has an extra plug in board with regulated supplies; the whole of the disc input/RIAA equalisation is constructed around discrete components.

LAB REPORT

Exceeding the specified output throughout the audio bandwidth into an 8ohm load, output fell by 2.5dBW with both channels driven into 4ohms. 14dBW was delivered pulsed into 2ohms, and the instantaneous peak current recorded at $\pm 13A$. Total harmonic distortion was moderate, and the full level intermodulation result good. The disc stage IM figures were unexceptional, especially on the moving-coil setting.

Noise figures were all adequate and power amplifier DC offset was held to low levels. Overload margins fell somewhat at high frequencies on the various vinyl disc inputs. The CD model's mm disc input gave comfortably the best IM figures of the three, but otherwise fell between the SA's mm and m-c inputs on measurement. Stereo separation was

good, especially in the midband, and volume/balance tracking was fine for a unit at this price level.

Sensitivities were well selected, as were the loadings on both disc inputs. However, the low 13kohm aux input loading could cause some sources trouble, so its worth checking the compatibility of your ancillary equipment before purchase.

The auxiliary input exhibited a typically flat, bandlimited response. Where the CD was commendably flat, the SA's RIAA response at both gain settings showed some bass boost below 100Hz and very mild treble lift above 2kHz, with both subsonics and ultrasonics sensibly curtailed. The supply modulation test shows some harmonic signal distortion with 50Hz and 100Hz fundamental and harmonic breakthrough.

SOUND QUALITY

The sound quality of these two amplifiers was virtually identical when auditioned *via* the CD input, a solid 'good+' rating representing a fine result at the price. Clean, clear and tidy if tonally a touch lightweight, the bass had a crisp, articulate and well differentiated quality. Some mild treble grain was evident, though stereo focus and depth were both good. Drive to full level sounded quite pleasant at the clipping/overload point, and proved happy with some of the more difficult loudspeaker loads.

The 240CD gave a 'good' rating for the normal analogue disc input. The reproduced sound was smooth enough but had some midrange muddle and less than precise stereo focus. Stereo depth was moderate but stage width was well up to scratch. The bass could have been a little 'faster', with more weight. The SA alternative uprated the score to 'good+'. Good midrange clarity and definition accompanied more than promising focus and depth. The overall sound was lively and informative.

CONCLUSIONS

These latest QED 240 models have shown a significant advance in performance and maintain their strong competitive position. The SA version fully justifies its pricing, and the moving-coil performance is commend-

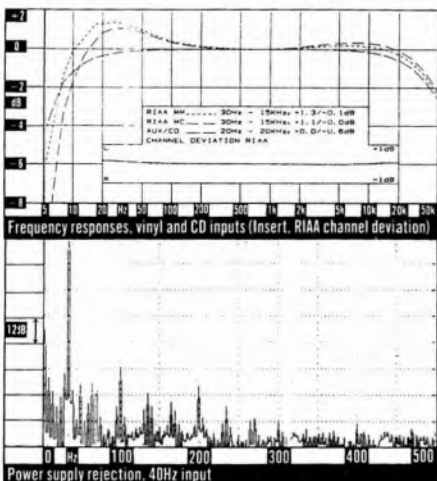
able. For those with a less ambitious view of analogue replay the 240CD would be a wise choice, maintaining the fine CD performance and coming with a competent mm disc input.

As before, the CD model may be upgraded by the subsequent addition of the SA disc board. Finish, build and performance have all been improved, and both new 240 models are firmly placed in the Best Buy category.

TEST RESULTS

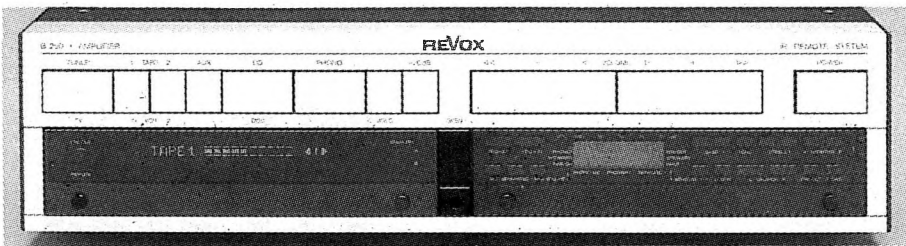
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		40W (= 16dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	16.4dBW 17dBW 16.9dBW		
Both channels, 4ohm load	12.4dBW 14.4dBW 14.3dBW		
One channel, 2ohms, pulsed	-dBW 14dBW -dBW		
Instantaneous peak current	+13A -13A		
Distortion			
Total harmonic distortion,	20Hz 1kHz 20kHz		
at rated power, aux/CD in.	-59dB -60dB -55dB		
Intermodulation, 19/20kHz, rated power, aux input	-75dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	50dB (-75dB)*		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	-28dB		
Noise			
Disc (mm) input (1HF, CCIR weighted)	-76dB (-71dB)*		
Disc (mc) input (1HF, CCIR weighted)	-64dB		
Aux/CD input (1HF, CCIR weighted)	-75dB		
Residual, unweighted (volume control at min)	-79dB		
DC output offset	left 4mV, right 15mV		
DC offset, pre-amp	left n/a mV, right n/a mV		
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	33.4dB 35.0dB 29.1dB		
Disc (mc) input (1HF)	28dB 28.3dB 17.2dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	62dB 76dB 55dB		
Aux/CD input	66dB 74dB 52dB		
Output impedance (damp)	0.1ohm 0.09ohm 0.12ohm		
Channel balance, disc, at 1kHz	0.36dB		
Volume/balance tracking			
Aux/CD input	0dB 0.06dB 0.43dB 1.28dB		
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.59mV	55kohms 180pF
Disc (mc) input*		0.026	600ohms n/a nF
Aux/CD input		39mV	12.9kohms 20pF
Output, pre-amp (tape)		10.0V max, 4.5kohms	
Size (width, height, depth)		43x6 4x26cm	
Typical price inc VAT		£160 CD; £219 SA	

*A240 SA - graphs below



REVOX B250

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



This is the latest, expensive, high tech Revox amplifier, designed for those who want a cleverly engineered, well made and beautifully constructed, multi facility product. Styled and sized to match their CD player, the front panel is devoid of knobs, but bristles with pushbuttons and informative displays.

Facilities are so numerous that time needs to be spent with the manual to get the best out of this amplifier. At the time of writing there were only two B250s in the UK, and no English translation of the manual was yet available, so we had to spend some time decoding the function buttons. Using a mixture of common sense and trial and error, plus guidance from the displays, a working knowledge of the essential functions was soon established.

The top panel, described as the 'primary operating field', has a row of large square and oblong input selection key pads for tuner, two tape recorders, 'aux', CD, and phono - moving magnet only on our sample, but a moving-coil option will be available. Alongside these, the electronic volume control is variable up and down in 1 or 3dB steps, and down in 20dB jumps.

Flipping down the right hand glass panel illuminates the LCD display and gives access to the secondary operating field. A plethora of facilities enables recording of one source while listening to another, provides bass and treble tone controls or bypass, speaker selection (two sets) and so on. Input sensitivities and preset maximum volume settings can be stored. Separately available, a remote allows total control of all the main functions, while a timer/controller unit adds five more audio inputs and enables multi-room capability.

Build is very good both inside and out. Modular construction uses plug-in cards and a mother board. The double mono power amplifier has 8 power transistors and a generous 2x22,000µF supply capacitance per channel, fed from a single enclosed power transformer.

The disc input stage has a board all to itself and comprises discrete components with paralleled input transistors. All other inputs use the ubiquitous 5532 dual operational amplifiers. Many digital chips are in evidence and much of the design would not seem out of place in a computer - with build quality to match. Electronic output protec-

LAB REPORT

Power specifications of 21dBW were exceeded into 8ohms and well maintained into the 4ohm load with both channels driven. Rated level was even achieved on the 2ohm pulse test. The peak current capacity of ±26A is not exceptional, but more is available if some waveform breakup is ignored. Distortion figures were excellent in the main, though merely good on disc input intermodulation.

Noise performance was good and overload margins fine on all inputs. DC offset was reasonable and output impedance low. The stereo separation was very good, and fine balance was maintained over the range of the volume control.

Input sensitivities and loadings are variable over a sensible spread. The RIAA response was well engineered, with a moderate bass rolloff below 200Hz. The excellent power supply modulation test result shows no visible mains supply artefacts.

SOUND QUALITY

The last Revox integrated amplifier was technically innovative, but did not fare too well subjectively. This new model is more traditional in basic design (apart from its automated features) and interestingly produced a significant improvement in sound quality. It scored above average *via* the analogue disc input, rising to good *via* the line inputs. This represents a great advance over the earlier model and suggests a radical change in thinking at Revox.

Using analogue disc (moving magnet, we were reviewing ahead of the delivery of the optional mc board) this amplifier sounded relaxed with a comparatively neutral mid range and competent bass. Somewhat weaker in midband and treble clarity, and lacking a full measure of depth, the treble showed some mild 'sizzle' and sibilance effects. Stereo focus was fine, though the soundstage was a bit narrowed. More drive and life would have been welcome.

The standard improved noticeably, driven from a high quality CD source, with increased depth and clarity. The sound remained a little 'processed' but with better dynamic contrasts providing a more interesting result. In marked contrast to its predecessor, the B250 proved very capable into a wide range of loudspeaker loads, and could be driven to high sound levels, showing

a respectably clean performance into clipping. This model certainly contains a generous power amplifier section.

CONCLUSIONS

With a radical change in circuit design, this new integrated amplifier offers excellent build and finish with a highly sophisticated range of facilities and every conceivable feature, including the ability to interface with remotely controlled around the house sound. Providing sufficient power for any application and good load tolerance, the sound quality rating is now closer to established critical standards, so the new B250 is well worth considering especially if the overall package appeals.

TEST RESULTS

Power output	Integrated amplifier 120W (=21dBW)		
Rated power into 8ohms, maker's spec	20Hz	1kHz	20kHz
Power output	21.9dBW	22.0dBW	21.8dBW
One channel, 8ohm load	21.1dBW	21.3dBW	20.3dBW
Both channels, 4ohm load	-dBW	21dBW	-dBW
One channel, 2ohms, pulsed	-dBW	+26A	-26A
Instantaneous peak current			

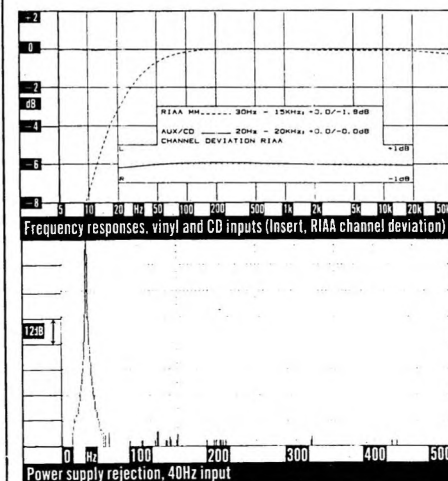
Distortion	20Hz	1kHz	20kHz
Total harmonic distortion, at rated power, aux/CD in.	-88dB	-91dB	-83dB
Intermodulation, 19/20kHz, rated power, aux input			-97dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-73dB

Noise	left 26mV, right 23mV		
Disc (mm) input (1HF, CCIR weighted)			-75dB
Aux/CD input (1HF, CCIR weighted)			-72dB
Residual, unweighted (volume control at min)			-95dB
DC output offset			left n/a mV, right n/a mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	34.3dB	33.7dB	32.4dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB

Stereo separation	86dB	77dB	56dB
Disc input (mm)	86dB	87dB	88dB
Aux/CD input	0.1ohm	0.11ohm	0.22ohm
Output impedance (damp)			0dB
Channel balance, disc, at 1kHz		-20dB	-60dB

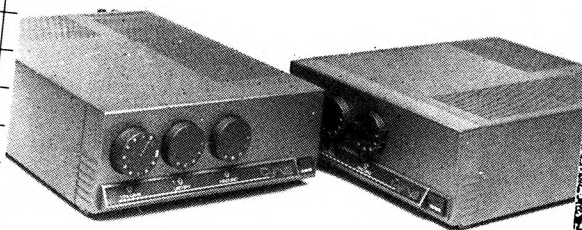
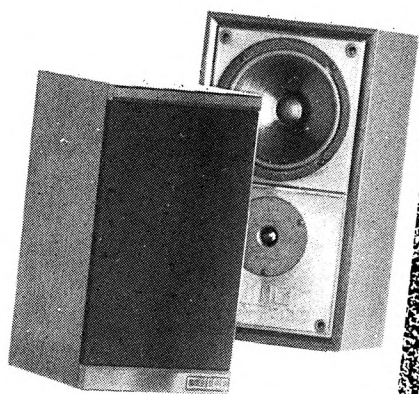
Volume/balance tracking	0.1dB	1.09dB	0.10dB
Aux/CD input			

Input data	socket type	sensitivity	loading
Disc (mm) input	2.64-	0.27mV	48.5kohms 60pF
Aux/CD input	81.5-	25mV	47kohms 315pF
Power amp	n/a	n/a mV	n/a kohms n/a pF
Output, pre-amp (tape)			11V max, 600ohms
Disc equalisation error, 30Hz-15kHz			+0.0dB, -1.8dB
Size (width, height, depth)			45x10.9x36.5cm
Typical price inc VAT			£112£



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BEST BUY



The latest in a long line of the successful 820 series, the basic recipe for this budget amplifier continues, but detailed changes and revisions require full review re-assessment. Now rated at 30W, the 820 has gained 10W since the last *Choice* review and the styling has also changed.

This economy model has bass, treble, volume and balance controls, plus switching for tone defeat/mono, tape monitor and input selection, covering disc (mm only), CD, tuner and AV/aux. There is also a headphone socket, plus power and remote speaker switching. The back panel contains the minimum of phono socket inputs, 2 sets of binding post/sockets for loudspeaker connection.

All the active circuitry is contained on one large printed circuit board covering most of the case area. The phono stage (moving magnet only) is constructed around a low noise NE5532 dual operational amplifier with series feedback RIAA equalisation. There is also a similar op-amp in the following pre-amplifier stage. The power amplifier is built up from discrete complementary high power output transistors mounted on an internal heat sink. The power supply comes via board-mounted 6,800µF capacitors. Engineering and manufacture are competent, and the mains connections fully shrouded.

LAB REPORT

Supply ripple rejection was poorer than average, showing some 100Hz and 200Hz breakthrough. However, the 17dBW power bandwidth easily exceeds the maker's claim. Showing a moderate fall into 4ohms, the 15dBW pulsed output into 2ohms managed to match the manufacturer's 8ohm rating. The peak current had a good if somewhat asymmetric +15/-19A available. Both types of distortion were comparatively low and the signal-to-noise performance suitably quiet. DC offset was considered a little high on this sample, but not so as to cause problems, and the output impedance was low.

Input overload margins were good and stereo separation well maintained. The measured sensitivity, loading and channel

balance were all acceptable. The frequency response of the line input was very flat from 50Hz to 10kHz, and was sensibly bandwidth limited with a gentle rolloff at each end. The RIAA equalisation was very accurate at this price level with well extended bass above a steep rolloff, though ultrasonic response showed a slightly worrying rise.

SOUND QUALITY

Results from the listening tests showed that the redesign effort has been well worthwhile. The modest 820A has now been brought up to the standard of the renowned BX (though not quite to that of the BXII as yet). A straight 'good' was achieved overall, which is excellent for the price, and the analogue disc input was sufficiently good not to prejudice the overall result.

The general standard was fine on analogue disc (mm only) with both focus and clarity above average. The 820A delivers a decent level of interest and drive as well as the makings of a wide soundstage with some focus and depth. Mild colorations included a degree of 'boxiness' on vocals and a touch of sibilance and grain in the treble. The bass was tolerably good.

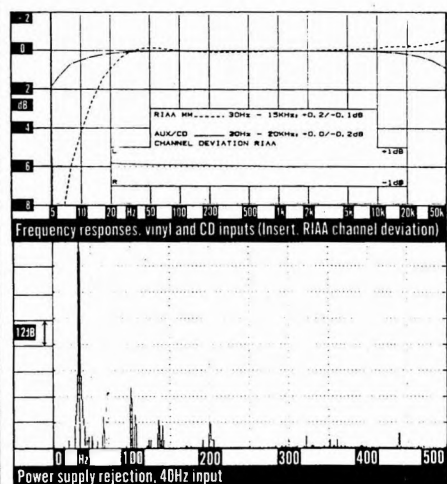
Focus sharpened up a bit with CD providing a purer top end. The sound was cheerful with quite good bass rhythm and a pleasant midrange tonal balance. The good pedigree was also demonstrated by generous load tolerance, clipping behaviour, and an ability to sound rather louder than the modest 30W/channel specification might suggest.

CONCLUSIONS

Rotel have smartened up their long established economy model, with an all round improvement in measured performance, output power, loudness, and sound quality. The RA820A has always represented good value, and this latest version brings it firmly back into the Best Buy category.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	30W (= 15dBW)		
Power output	20Hz 1kHz	20kHz	
One channel, 8ohm load	17.0dBW	17.25dBW	17.1dBW
Both channels, 4ohm load	13.2dBW	14.2dBW	14.0dBW
One channel, 2ohms, pulsed	-dBW	15dBW	-dBW
Instantaneous peak current		+15A	-19A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-68dB	-80dB	-73dB
Intermodulation, 19/20kHz, rated power, aux input			-81dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-77dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-73dB
Aux/CD input (1HF, CCIR weighted)			-80dB
Residual, unweighted (volume control at min)			-82dB
DC output offset		left 43mV, right 44mV	
DC offset, pre-amp		left n/a mV, right n/a mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	34.6dB	33.2dB	32.6dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	70dB	71dB	46dB
Aux/CD input	78dB	73dB	48dB
Output impedance (damp)	0.06ohm	0.060ohm	0.066ohm
Channel balance, disc, at 1kHz			0.62dB
Volume/balance tracking			
Aux/CD input	0.04dB	0.64dB	1.97dB
Input data			
Disc (mm) input	socket type	sensitivity	loading
Aux/CD input		0.53mV	47kohms 140pF
Output, pre-amp (tape)		28.6mV	18kohms 170pF
Disc equalisation error, 30Hz-15kHz			13.4V max, 2kohms
Size (width, height, depth)			+0.2dB, -0.1dB
Typical price inc VAT			44.4x8.5x30.5cm
			£125



ROTEL RC/RB 850

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



This is Rotel's new £250 separates amplifier system and uses the considerable experience of their hitherto successful UK design team.

The cleanly designed pre-amplifier is finished in satin black and not overburdened with an excessive number of rarely used functions. Bass and treble controls are provided but may be bypassed, and a mono switch is also available. The front panel is dominated by a large centrally located volume control, with function selection and tape monitoring provided by rotary switches. The back panel contains gold plated phono sockets with inputs for disc (moving magnet and moving-coil), CD, tuner, two tape machines, and 2 'aux'/AV inputs, plus one input and output offering the facility to route a video signal through the pre-amplifier.

The 50W per channel (17dBW) power amplifier is a plain uncluttered box with only an on/off switch on the front. A switch on the back panel engages bridged mono operation, which increases power output to 150W. Binding post/4mm sockets are provided for speaker connection, and good quality phono sockets connect to the incoming signal.

Internal inspection of the RC850 reveals the single board construction and short signal paths used wherever possible. All gain stages are based around selected 5534 operational amplifiers, and the disc stage is gain switched for mm or m-c operation. Some of the capacitors have been chosen on sound quality grounds, and other passive components considered less important are good commercial grade. The mains transformer is encased in steel to control hum fields.

The RB is a dual mono, two transformer, symmetric design of single board construction, using discrete components. Generous 2x10,000µF power supply capacitors per channel are mounted on the main amplifier board. Minimal internal wiring allows a very tidy and high standard of construction. Separate internal heatsinks are provided for each set of 4 robust output transistors, and the only protection is supply line fuses.

LAB REPORT

The power amplifier was well up to specification, achieving 18dBW. It held up well into lower impedances thanks to the very generous peak current capacity; ±25A is greater

than many amps with much higher specified output ratings. In bridged mode into 8ohms (one channel only) 23dBW (200W) was available.

The measured harmonic distortion and intermodulation results were very good and the signal-to-noise ratios were up with the best. Separation was quite good, balance was perfect, and the DC offset was low. Bandwidth was rolled off very slightly at the bass end, some 0.5dB down at 20Hz, but was well extended at high frequencies. The power spectrogram was fairly clean, albeit with some 100Hz and 200Hz breakthrough.

The pre-amp's total harmonic and intermodulation distortion figures were very good, and the noise on all inputs adequately low. Overload margins were all fine and stereo separation was also good. Channel balance was generally good, except that a 4dB error was noted at low volume settings. The RIAA was very accurate, exhibiting a sensible bass rolloff. RIAA channel deviation was negligible, and the line input response was flat within +0/-0.1dB limits, 20Hz to 20kHz.

SOUND QUALITY

This pre-amplifier returned a very respectable score considering its modest price, rating 'good' for the m-c cartridge and rather better *via* the CD input. Very neutral with a pleasant tonal quality and an unfatiguing quality *via* moving-coil, the bass was competent, even and extended, and the treble unobtrusive. Some loss of subtle detail was noted in the midrange and treble, while the soundstage seemed a little flat, the stereo lacking full depth and clarity. 'Bland' was one of the comments used, yet the good sonic rating speaks for itself. A small improvement was apparent *via* the moving magnet disc input.

The CD input's rating improved considerably, rivalling established pre-amplifiers at several times the price. The bass was clean and deep with good articulation, the treble only slightly dulled with a mild loss of detail. The stereo was nicely focused with worthwhile width and depth.

The power amplifier sounded exceptional for its price category, pointing to considerable potential for use with more expensive pre-amps, or in multiple amplifier active loudspeakers. Clarity and instrumental separation was good, while a mildly 'lean', 'pinched' effect in the midband did not appear to detract from decent stereo staging with good depth and focus. Some 'grain' and 'edge' was audible in the treble, but was not considered too serious, while the bass was strong with good speed and drive.

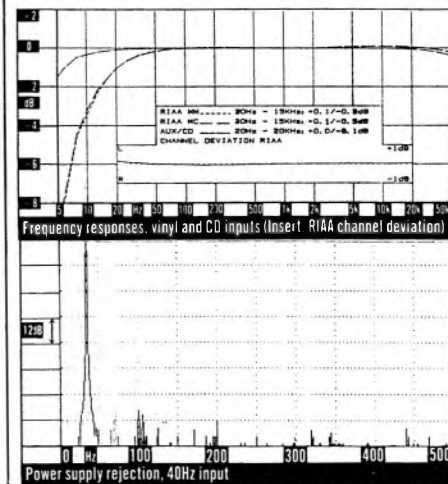
CONCLUSIONS

The RC850 is remarkably good for the price, makes a worthy 'budget separates' combination with the RB850, and clearly merits Recommendation. The RB850 could also

partner a superior pre-amp, though it is hard to think of one at a similar price. Alternatively one could buy two, for bi-amping suitable loudspeakers. That aside, the RB850 and the combination of the two obviously merit Best Buy ratings.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		50W (= 17dBW)	
Power output	20Hz 1kHz 20kHz		
One channel, 8ohm load	18.0dBW 18.1dBW 18.0dBW		
Both channels, 4ohm load	16.5dBW 16.9dBW 16.7dBW		
One channel, 2ohms, pulsed	-dBW 16.5dBW -dBW		
Instantaneous peak current	+25A -25A		
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz 1kHz 20kHz		
	-80dB -84dB -72dB		
Intermodulation, 19/20kHz, rated power, aux input			-85dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-77dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-77dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-78dB
Disc (mc) input (1HF, CCIR weighted)			-65dB
Aux/CD input (1HF, CCIR weighted)			-88dB
Residual, unweighted (volume control at min)			-90dB
DC output offset		left 10mV, right 6mV	
DC offset, pre-amp		left n/a mV, right n/a mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	34.5dB 32.9dB 32.1dB		
Disc (mc) input (1HF)*	36.0dB 34.3dB 30.2dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	75dB 74dB 57dB		
Aux/CD input	75dB 74dB 57dB		
Output impedance (damp)	0.02ohm 0.025ohm 0.028ohm		
Channel balance, disc, at 1kHz			0.01dB
Volume/balance tracking			
Aux/CD input	0dB 0.02dB 0.17dB		-60dB 4.1dB
Input data		socket type	sensitivity loading
Disc (mm) input			1.22mV 47kohms 110pF
Disc (mc) input*			0.147mV 190ohms n/a nF
Aux/CD input			79mV 45kohms 140pF
Power amp			137mV 28kohms 150pF
Output, pre-amp (tape)			12.5V max, 100ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, -0.5dB
Size (width, height, depth)			RC 44.4x6.6x28.5 RB 44.4x8.6x33.6cm
Typical price inc VAT			£119 + £130
*See text			



ROTEL RA-870BX

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

BEST BUY



This is the latest version of Rotel's already established 870 series. Now in BX form, with rated output increased to 80W, it should be a strong performer in its price category if the company's track record is anything to go by. In contrast to the 'purist' 820BX this is a full facility design and incorporates switching for video as well as audio signals.

Apart from the pushbutton power and remote speaker switches, all other controls are rotary. The remainder include bass and treble, tone defeat/mono, concentric volume/balance, plus separate 'CD direct' volume and switching. Comprehensive tape monitoring facilities are sited alongside the main input selector.

The rear panel phono sockets provide inputs for disc (mm or m-c, selected by an adjacent switch), CD, tuner, 2X tape, video disc, video recorder, and TV monitor out. All video related inputs have two audio channels and one video. Separate pre-amp out and power amp in sockets are linked by a removable pin in normal use. Two sets of binding posts/4mm sockets are provided for speaker connection.

Internal construction is to a high standard and follows much modern thinking (and good audio engineering practise), for example placing the input switching near the input terminals. Some ribbon cable is used for board-to-board connections and some links use wire wrap techniques. The phono and pre-amp stages are built around selected low noise operational amplifiers with the power supplied from discrete regulator circuits. High quality Alps pots are used for both main and CD direct volume controls.

The power supply comes from a single large transformer, with separate on-board rectifiers and smoothing for each channel. Six large transistors per channel are bolted to each of the two heatsinks, and the output is fuse protected to the upper set of speaker terminals (which are connected directly to the board). The output is also thermally protected, with front panel warning light.

LAB REPORT

The 20.5dBW output met power specifications without any problem, and held up extremely well on both 4 and 20hm tests. The instantaneous current capability was asym-

metric, but a very generous +30/-35A. Harmonic distortion figures were good and so were the intermodulation results on both disc inputs. Full power IM results were a little worse than expected, though still reasonable. Noise performance was generally adequate, though the moving-coil disc input would benefit from being a few dB quieter.

Input overload margins were generous on all inputs. Stereo separation suffered as frequency increased, but it still just suffices at 20kHz. Output impedance was negligible and channel balance good over the full dynamic range of the volume control. Input sensitivities and loading were well chosen on all pre-amp inputs, though the power amplifier driven alone is a little insensitive.

The RIAA response was well engineered over the important octaves. All inputs were rolled off under 100Hz - the disc stages some 2dB down at 20Hz with a steep rolloff thereafter. RIAA channel matching was acceptable, showing some differences but keeping these within .5dB limits.

SOUND QUALITY

Earlier pre-BX 870 models have done well enough in the past, albeit somewhat overshadowed by smaller units such as the 820BX series. However, the substantial advance wrought by this BX redesign indicates that the 870 is now a keener contender.

One welcome aspect was the good consistency shown between the three main inputs (m-c, mm vinyl disc and CD), with a strong 'good+' overall rating. The basic character is dynamic and lively, with a crisp powerful bass showing slam, extension and articulation. It must be conceded that the midband was slightly 'hardened' and 'electronic sounding', but this did not attract undue censure. The treble added a touch of high frequency 'sheen' and forwardness, but did not slide towards obvious sibilance or 'grain'.

Clarity was consistently high, and the amplifier produced solid, well focused stereo images of good scale and width, plus decent depth and ambience. It sounded very muscular, appearing to be in total control of the loudspeakers, and where necessary battering them into submission to its will. Sounding for all the world like a more refined and powerful 820 BX2, this new 870 proved capable of

high loudness levels into virtually any load, and also demonstrated good clipping performance.

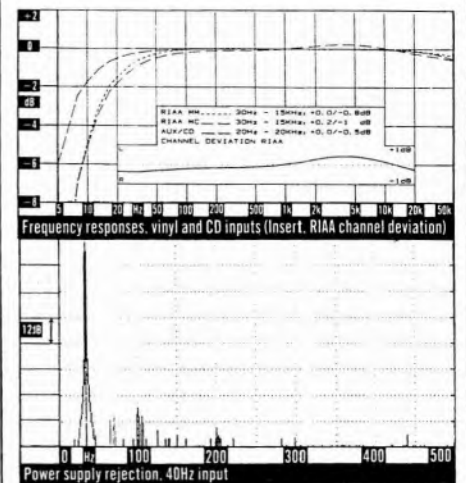
CONCLUSIONS

The RA870BX is a demonstrable success. At a comparatively modest price it delivers a lot of power and output current, with a well balanced technical performance and thoroughly up to date sound quality. Notable for its drive and dynamic control, this amplifier is clearly a strong performer that deserves Best Buy status.

TEST RESULTS

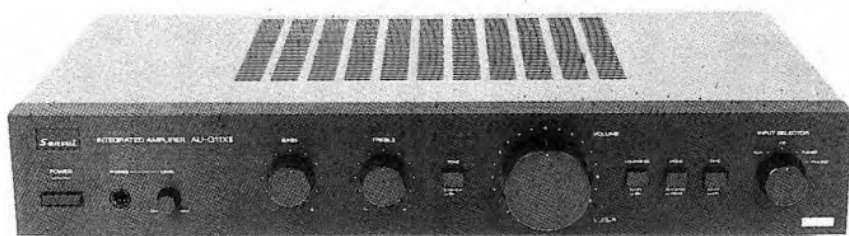
Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		80W (= 19dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.5dBW	20.8dBW	20.6dBW
Both channels, 4ohm load	18.7dBW	19.2dBW	19.1dBW
One channel, 2ohms, pulsed	-dBW	20dBW	-dBW
Instantaneous peak current	+35A	-35A	-30A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-77dB	-88dB	-77dB
Intermodulation, 19/20kHz, rated power, aux input			-54dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-76dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-78dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-72dB
Disc (mc) input (1HF, CCIR weighted)			-63dB
Aux/CD input (1HF, CCIR weighted)			-73dB
Residual, unweighted (volume control at min)			-74dB
DC output offset		left 17mV, right 1mV	
DC offset, pre-amp		left n/a mV, right n/a mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	34.2dB	32.3dB	32.0dB
Disc (mc) input (1HF)	35.0dB	33.4dB	33.3dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	93dB	64dB	38dB
Aux/CD input	93dB	64dB	38dB
Output impedance (damp)	0.04ohm	0.03ohm	0.05ohm
Channel balance, disc, at 1kHz			0.33dB*
Volume/balance tracking			
Aux/CD input	0dB	-20dB	-60dB
Disc (mm) input	0.09dB	1.24dB	0.70dB
IMM Data			
Disc (mm) input	socket type	sensitivity	loading
Disc (mc) input*		0.27mV	47kohms 103pF
Aux/CD input		0.029	180ohms n/a nF
Power amp		16.8mV	35kohms 250pF
Output, pre-amp (tape)		109mV	20kohms 120pF
Disc equalisation error, 30Hz-15kHz			11.2V max, 100ohms
Size (width, height, depth)			+0.2dB, -1.0dB
Typical price inc VAT			44.5x11.4x32.7cm
			£325

*See text



SANSUI AU-G11X

SANSUI (UK) LTD., UNIT 10A, LYON IND. EST., ROCKWARE AVENUE, GREENFORD, MIDDX. TEL: 01-575 1133.



This compact budget integrated amplifier, claimed to be designed primarily for sound quality, is attractively finished with gold lettering on a well-ordered fascia, incorporating many of the usual facilities without producing operational confusion. It is priced a little over budget level at £139, and is rated at 25W/channel (14dBW). The disc input is moving magnet only, the tone controls are supplemented by a defeat switch, and further switches select loudness, mono/stereo and tape monitoring.

The headphone socket is accompanied by its own small volume control, and is in fact driven by its own little amplifier, independent of the loudspeaker connection and main signal path. The rear panel socketry is phono throughout, with a single pair of loudspeaker output binding posts, capable of taking quite heavy gauge cable. The overall external finish is to the expected high standards, and the unit feels reassuringly heavy considering its modest price and pretensions.

LAB REPORT

Using a medium sized transformer, the shared 5,800 μ F power supply incorporates extensive regulation and decoupling for different stages. The separate headphone amplifier avoids switching in the speaker path and gives optimum headphone drive. There is evidence that care has been taken in signal path component selection, with polystyrene capacitors etc, and direct wiring paths. The conventional bi-polar output uses generous high current transistors.

Power output is fairly generous, comfortably above the admittedly modest 25W specification and quite load tolerant besides. Distortions were very low, and noise levels and overload margins were generally satisfactory. The DC offset was a little larger than average, and high frequency stereo separation is only just satisfactory. Inputs should be fine for compatibility with other components. The disc input RIAA curve shows good component tolerancing and an even midband, with sensible bandlimiting at the extremes (amounting to a possibly audible -1dB at 15kHz). Power supply modulation seemed very well under control.

SOUND QUALITY

Rating a little above average, the *G11X* certainly delivered a cleaner clearer sound than what one might call the 'Far Eastern norm', but on balance it also fell a little short of the achievements of other audiophile-oriented integrated models at around the same price.

A degree of disc surface noise exaggeration was noted, and the most obvious characteristic was that the sound remained tightly controlled, at the expense perhaps of a little 'weight' and 'attack'. Focus was pretty good, but there was some loss of depth, with mild congestion, and a slightly 'dulled', 'thickened' effect. Coloration was generally low, but with some 'steeliness' noted when using CD as a source.

CONCLUSIONS

Producing a thoroughly respectable sound for a relatively modest price, the *G11X* also delivered a decent lab performance. Build quality and finish are both excellent with generous component quality and quite simple layout of signal paths. Taking commercial considerations into account, Sansui have chosen a sensible compromise between facilities and sound quality here, and Recommendation is appropriate.

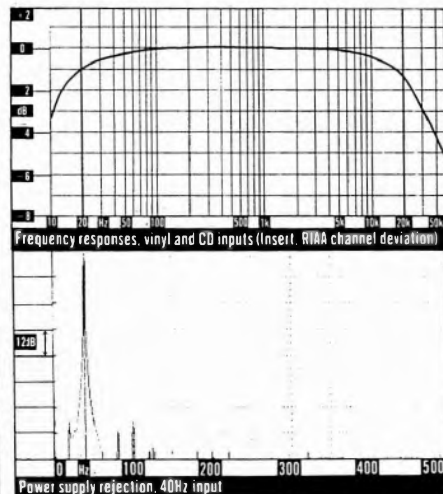
Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

Power: output		Integrated amplifier	
Rated power into 8ohms, maker's spec		25W (= 14dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.0dBW	15.9dBW	15.8dBW
Both channels, 4ohm load	13.3dBW	13.6dBW	13.5dBW
One channel, 2ohms, pulsed	-dBW	13.6dBW	-dBW
Instantaneous peak current		+11A	-11A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-82dB	-92dB	-70dB
Intermodulation, 19/20kHz, rated power, aux input			-80dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-73dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-70dB
Aux/CD input (1HF, CCIR weighted)			-73dB
Residual, unweighted (volume control at min)			-92dB
DC output offset		left 38mV, right 28mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	30.7dB	29.8dB	29.5dB
CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	61dB	52dB	29dB
CD input	61dB	51dB	28dB
Output impedance (damp)	0.26ohm	0.27ohm	0.25ohm
Channel balance, disc, at 1kHz			0.06dB
Volume/balance tracking			
Aux input	0.98dB	0.02dB	1.6dB
Input data			
Disc (mm) input	Phono	sensitivity 0.44mV	loading 48kohms 100pF
CD input	Phono	30mV	63kohms 215pF
Output, pre-amp (tape)			10.1V max, 1ohms
Disc equalisation error, 30Hz-15kHz			+0.06dB, -0.60dB
Size (width, height, depth)			43x7.5x28cm
Typical price inc VAT			£139

Reassessed



TECHNICS SU-V55A

PANASONIC UK LTD., 300-318 BATH ROAD, SLOUGH, BERKS SL1 6JB. TEL: (0753) 34522.

RECOMMENDED



Technics products invariably have a quality finish and feel, and the *SU-V55A* is no exception. This is a large integrated amplifier with a host of facilities, accessed from a complex front panel adorned with many knobs and switches. Technics claim good power delivery into 4ohm loads, and the 60W per channel (18dBW) *V55A* should have no problem driving the majority of modern speakers.

Carrying the familiar (if somewhat misleading) 'Class AA' label, which describes part of the circuit design, the front panel is logically set out and easy to use. The bass and treble controls can be bypassed by a defeat switch, but balance remains in circuit at all times. A rotary selector directs the required input to the 'record out' socket. Input facilities include moving magnet and moving-coil disc, CD, 'aux', tape 2 and tape 1/DAT. Two pairs of twistlock speaker outputs are provided, selected by the front panel switch, and a headphone socket is also available. A 'CD direct' button is placed in its own section of the front panel, routing an incoming CD signal directly to the volume control.

A good quality power transformer supplies the large 2x8,200µF reservoirs shared between channels. The power amplifier is a single hybrid module which provides both channel's outputs and electronic protection. A heat pipe transfers heat away from the output circuits to aluminium fins *via* a hermetically contained fluid. Other circuitry comprises a mixture of discrete transistors and integrated circuits. Good commercial standard passive components are used, but none appear to be of specific audiophile quality.

LAB REPORT

Peak power output was a healthy 19.6dBW into 8ohms, falling to 17dBW into 4ohm but keeping up well into 2ohms (reflecting the generous ±20A peak current rating). Total harmonic distortion was low, and intermodulation distortion reasonably so.

Noise performance was generally good, but the moving coil input could benefit from some improvement. DC output offset was zero, and output impedance low. Overload margins were fine, and stereo separation on both line and disc inputs was good in the

midband but unexceptional at higher frequencies. Input sensitivities and loading were typical of mainstream products, and should comfortably match many ancillaries.

Volume/balance tracking strayed a little at low settings. The supply modulation test revealed no gremlins, with mains rejection of the highest order. The frequency response was flat on line inputs, with sensible rolloffs at the frequency extremes. The RIAA response was well tailored on the moving magnet setting, but moving coil showed some mild anomalies, especially at high frequencies.

SOUND QUALITY

Following the current fashion for improving sound quality, this mid-priced design proved no slouch in the listening tests. Rating a solid 'good' *via* analogue disc inputs, with a significant bias in favour of the moving magnet result, it went on to improve slightly *via* its CD input – despite a wide range of features and facilities which normally detract from subjective performance.

The sound was smooth if slightly coloured, with a mildly 'wooden' effect on cellos. Despite a touch of sheen in the high treble, and a bass which lacked drive and interest, the midrange was clearly well defined and stereo showed good width and depth plus a degree of precise focus. Vocal sibilants were pure, and the sound subjectively low in distortion.

Results with CD sources were most respectable, scoring up with the better and highly rated UK models. The bass had firm definition with good extension and weight, while treble 'grain' was low. The midrange showed no undue hardness but good clarity and definition were the watchwords here. Stereo images were well focused and stable, with a healthy depth and ambience, plus decent dynamic life and 'attack'. Driven to high levels, this amplifier behaved well, with tolerable pleasant clipping, decent loudness and good load tolerance; nor was it over-protected.

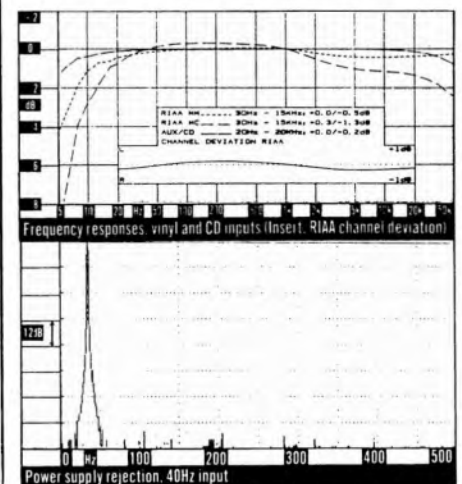
CONCLUSIONS

This modern amplifier offers the expected

fine build quality and finish along with a wide range of features. Power delivery was good and a decent level of sound quality was achieved despite these facilities, tone controls and the like. As a package it constitutes fine value and deserves 'Best Buy' status.

TEST RESULTS

Power output		Integrated amplifier		
Rated power into 8ohms, maker's spec		60W (= 18dBW)		
Power output	20Hz	1kHz	20kHz	
One channel, 8ohm load	19.6dBW	19.9dBW	19.8dBW	
Both channels, 4ohm load	16.5dBW	17.4dBW	17.3dBW	
One channel, 2ohms, pulsed	-dBW	17dBW	-dBW	
Instantaneous peak current		+22A	-19A	
Distortion				
Total harmonic distortion,	20Hz	1kHz	20kHz	
at rated power, aux/CD in	-80dB	-85dB	-80dB	
Intermodulation, 19/20kHz, rated power, aux input			-78dB	
Intermodulation, 19/20kHz, at 0dB, disc (mm)			-72dB	
Intermodulation, 19/20kHz, at 0dB, disc (mc)			-65dB	
Noise				
Disc (mm) input (1HF, CCIR weighted)			-71dB	
Disc (mc) input (1HF, CCIR weighted)			-63dB	
Aux/CD input (1HF, CCIR weighted)			-72dB	
Residual, unweighted (volume control at min)			-75dB	
DC output offset			left 0V, right 0mV	
DC offset, pre-amp			left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz	
Disc (mm) input (1HF)	32.0dB	31.2dB	31.1dB	
Disc (mc) input (1HF)*	30.2dB	29.3dB	27.3dB	
Aux/CD input (1HF)	>23dB	>23dB	>23dB	
Stereo separation				
Disc (mm) input	65dB	62dB	38dB	
Aux/CD input	75dB	65dB	40dB	
Output impedance (damp)	0.18ohm	0.18ohm	0.24ohm	
Channel balance, disc, at 1kHz			0.25dB	
Volume/balance tracking	0dB	-20dB	-60dB	
Aux/CD input	0.04dB	0.19dB	1.98dB	
Input data				
	socket type	sensitivity	loading	
Disc (mm) input		0.29mV	42kohms 120pF	
Disc (mc) input*		0.025mV	240kohms n/a nF	
Aux/CD input		18.5mV	40kohms 150pF	
Output, pre-amp (tape)			10.4V max, 2.5kohms	
Disc equalisation error, 30Hz-15kHz			+0.3dB, -1.3dB	
Size (width, height, depth)			43.0x12.4x20cm	
Typical price inc VAT			£200	
*See text				



TECHNICS SU-V85A

PANASONIC UK LTD., 300-318 BATH ROAD, SLOUGH, BERKS SL1 6JB. TEL: (0753) 34522.



The *SU-V85A* is a large and somewhat imposing, comprehensively equipped integrated amplifier with excellent finish. It has a nominal output of 100W (20dBW) and in common with all recent Technics products uses proprietary 'Class AA' circuitry.

If technical features, good build quality and excellent specifications are the main criteria for buying an amplifier then look no further. This Japanese built model is very well equipped, with no fewer than 22 controls and buttons on the front panel. Switches are available for power, speaker switching (either, both or headphone only), tone defeat, subsonic filter, audio muting, loudness, tape monitor and recording mode. Bass and treble tone plus balance controls are also included. Inputs accommodate phono, (mm or m-c) tuner, CD, 2 'aux', and 3 tape recorders, indicator LEDs illuminating to advise the function selected. There is also the now mandatory 'CD direct' button, which provides a more direct signal path in search of greater fidelity.

The rear panel houses phono sockets, and two pairs of speaker outlets. Considering the complexity the amplifier has been well designed in ergonomic terms and proved easy to use.

Build quality is to Technics normal high standard. Using Japanese multi-board construction techniques, the design is well executed with neat wiring, making use of ribbon cable where possible. The internally mounted, finned aluminium heatsink extrusion has two output transistors per channel. The power supply has rectification and smoothing on the power amplifier board and is fed from a single, fairly substantial transformer. The pre-amp is sited directly behind the front panel, using a combination of conventional commercial discrete components and ICs.

LAB REPORT

The 20dBW rating was easily justified on test, with a high 21.5dBW recorded over a wide power bandwidth, albeit with some signs of instability at the clipping point. The output fell only very slightly into 4ohms, but the 2ohm result is disappointing with only 14dBW available before waveform break up. The +15/-16A instantaneous peak current

is also a little low given the power ratings, indicating a 4-8ohm loudspeaker rating.

Distortion figures were good, with well suppressed intermodulation products. Input noise was low and DC offset zero. No complaint can be made about the overload margins, stereo separation or volume/balance tracking. Output impedance was quite low and the input sensitivities and loadings are fairly standard. However the 350pF on disc is a little on the high side and may affect the frequency response of some moving magnet cartridges (possibly for the better in most cases).

The frequency response was commendably flat on all inputs, with sensible rolloffs outside the audio band. The lack of RIAA channel deviation indicates good component tolerancing in the disc equalisation stages.

SOUND QUALITY

Building on the creditable performance of its smaller 55A brother, the 85A recorded an improvement roughly proportional to its price, and was firmly rated good for both cartridge inputs, with further improvement *via* the 'CD direct' terminal.

Used with a good CD player, the '85 had obviously good clarity, high definition and a clean 'open' character. The bass showed respectable drive and power, but this was not a particular strength. There was no question concerning the high standard achieved in the treble, however. Subjective distortion was low, and the sound nicely detailed, unobtrusive and informative. Stereo showed respectable depth, with fine overall focus and image stability, though there was slight narrowing.

The moving-coil input showed good performance, with above average bass and a clean, neutral midrange, with notably classy transient definition and good solo vocal exposition. With firm overall focus and solid, stable stereo, the impression was created of a strong generous amplifier in firm control of the situation. Hardness and 'grain' were held well down, and the result was quite musical and tonally well balanced. Driven to and beyond overload it could deal with some of the more difficult loudspeaker loads and was clearly a large powerful model, capable of high sound levels.

CONCLUSIONS

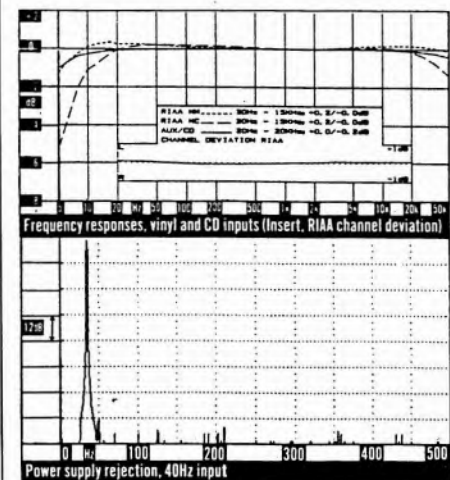
Past experience has tended to show larger integrated amplifiers in an unfavourable light, often offering poorer sound than cheaper brethren. However, this was not the case with the *SU-V85A*, and the excellent lab performance shows just how much can be achieved at this price level.

The sound quality was respectable, obtained without sacrifice to the features, and the considerable value merits recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		100W (=20dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.5dBW	21.7dBW	21.7dBW
Both channels, 4ohm load	18.6dBW	19.3dBW	19.3dBW
One channel, 2ohms, pulsed	-dBW	14dBW	-dBW
Instantaneous peak current		+15A	-16A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-82dB	-87dB	-76dB
Intermodulation, 19/20kHz, rated power, aux input			-88dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-76dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-70dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-74dB
Disc (mc) input (1HF, CCIR weighted)			-69dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-76dB
Residual, unweighted (volume control at min)			-81dB
DC output offset		left 0mV, right 0mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	33.2dB	32.7dB	30.4dB
Disc (mc) input (1HF)*	30.1dB	29.3dB	28dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	64dB	62dB	40dB
Aux/CD input	74dB	67dB	42dB
Output impedance (damp)	0.23ohm	0.23ohm	0.3ohm
Channel balance, disc, at 1kHz			0.59dB
Volume/balance tracking	0dB	-20dB	-60dB
Aux/CD input	0.02dB	0.10dB	0.15dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input		0.264mV	46kohms 350pF
Disc (mc) input*		0.0169mV	220ohms n/a nF
Aux/CD input		15mV	28kohms 310pF
Output, pre-amp (tape)			12V max. 640ohms
Disc equalisation error, 30Hz-15kHz			+0.2dB, -0.0dB
Size (width, height, depth)			43x15.8x39.3cm
Typical price inc VAT			£350

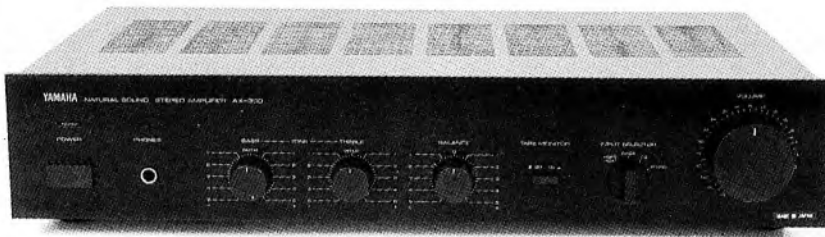
*See text



YAMAHA AX-300

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

RECOMMENDED



This just-above-budget-price £120 integrated Japanese amplifier is typical of the new breed of simplified designs which are aimed particularly at the UK market. It is a compact model, though taller than most of its competitors, rated at 30-40W, and finished inevitably in black. A functional if stark front panel has five knobs, two pushbuttons and a headphone socket. Supplementing the main volume control are three subsidiary rotaries for tone and balance, plus an input selector; the centre position on the tone controls labelled defeat. Tape monitoring and power switching are provided by the individual pushbuttons. The rear panel has phono sockets throughout, the disc input restricted to moving magnet cartridges, plus a single set of binding posts for loudspeaker connection.

LAB REPORT

Using a very clean single board layout, the 300 uses a high-gain discrete-component direct-coupled bi-polar power amplifier section which also includes the tone control circuitry, and so avoids using a line stage altogether. Output relays provide effective protection, disc input circuitry is dual IC, and although mains connections were unshrouded the unit generally showed very competent Japanese build quality throughout, with clear evidence of sound quality priority.

Power output was respectably above the fairly modest specification, and was also respectably maintained into low impedances, with a generous current capability of 15/16A. Distortion and noise measurements were both very good, overload margins and stereo separation were fine, and calibration reasonable enough for the price. Inputs should show no matching problems provided auxiliaries have normal output levels. The power supply modulation spectrum shows an excellent result at any price, while the RIAA disc equalisation might have been a little closer tolerated, and will provide a touch of 'character'.

SOUND QUALITY

The 300 was rated comfortably above average and close to a 'good' rating; it is clearly

one of the more impressive models at its price level - up with well regarded models costing considerably more. Not the most comfortable of sounds, the liveliness and dynamics provided the strongest impression, with good 'speed' and 'momentum' outweighing criticisms of some loss of transparency and a rather 'bright' overall balance. Not the subtlest or most controlled sounding performer, a natural sense of exuberance more than compensates.

CONCLUSIONS

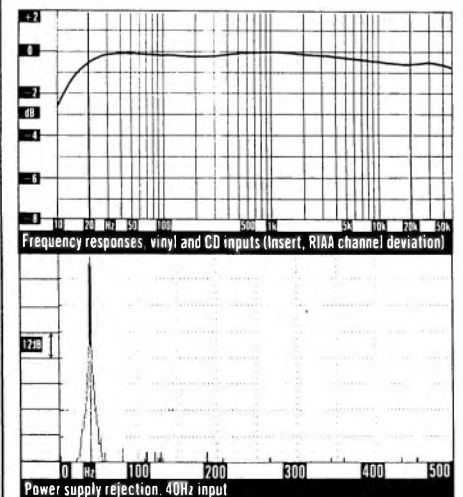
Fine build quality plus sound quality oriented engineering bring Yamaha strongly into the market for 'stripped down' budget audiophile integrated amplifiers with a very impressive contender. Livelier than most if a little less polite than many, the 300 clearly merits confident recommendation.

Test measurements

To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	20Hz	1kHz	20kHz
Power output	17.5dBW	17.5dBW	17.4dBW
One channel, 8ohm load	13.5dBW	14.5dBW	14dBW
Both channels, 4ohm load	-dBW	15.4dBW	-dBW
One channel, 2ohms, pulsed		+15A	-16A
Instantaneous peak current			
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-92dB	-95dB	-88dB
Intermodulation, 19/20kHz, rated power, aux input			-98dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-71dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-74dB
Aux/CD input (1HF, CCIR weighted)			-77dB
Residual, unweighted (volume control at min)			-86dB
DC output offset		left 17mV, right 17mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	32.5dB	32dB	31.8dB
Aux/CD input (1HF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	63dB	69dB	43dB
Aux/CD input	83dB	68dB	44dB
Output impedance (damp)	0.09ohm	0.09ohm	0.13ohm
Channel balance, disc, at 1kHz			0.65dB
Volume/balance tracking			
Disc/CD input	0dB	-20dB	-60dB
Aux/CD input	0.08dB	0.79dB	1.22dB
Input data			
Disc (mm) input	socket type	sensitivity	loading
Aux/CD input	Phono	0.49mV	47kohms 70pF
Output, pre-amp (tape)		11.5V max	560ohms
Disc equalisation error, 30Hz-15kHz		+0dB, -0.47dB	
Size (width, height, depth)			44x9.5x31cm
Typical price inc VAT			£120
*See text			
Reassessed			



YAMAHA AX-500

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



Yamaha's recent budget amplifiers have been well received in *Hi-Fi Choice*, so it's appropriate that we move up to a more costly model this time around.

The £200 AX 500 is very well equipped. A row of six touch buttons in the centre of the neatly styled front panel allow selection of two tape decks, video, tuner, CD and phono, with an extra 'CD direct' facility thrown in for good measure. Tone shaping includes standard bass and treble plus a continuously variable loudness/volume control. Other functions available from the front panel are subsonic filter, tone control bypass, speaker switching, mono switching, and a choice of moving-coil or moving magnet sensitivity. 'Record out' can be separately directed from any input, and a headphone output is also provided. Two sets of speakers can be connected to binding posts, and the pre- and power sections may be individually accessed via an external link on the back panel.

The power amplifier is constructed using discrete transistors on a separate circuit board, with high power Toshiba output transistors. A large power transformer supplies a pair of 12,000 μ F smoothing capacitors shared between the channels. The pre-amplifier and tone controls are based on integrated circuits, the boards neatly linked by ribbon cable. Output inductors are placed close to the output terminals on a small back panel mounted PCB, which switches the loudspeaker outputs remotely from the front panel.

LAB REPORT

The basic rating is 85W (19dBW) per channel into an 8ohm load, but the amplifier has been designed to drive lower impedance loads without any problem. The specified power output was easily met on test, 21.4dBW being achieved over the audio power bandwidth. The power supply was sufficiently large to maintain a creditable 18.3dBW into 4ohms (135W) with both channels driven and the good performance was continued with the 2ohm pulsed load; a generous ± 23 A was available for peaks. Harmonic and intermodulation distortion perform-

ance were both very good, but signal-to-noise ratios were only satisfactory. The DC offset measured a little high, especially on the right channel.

Ample overload margins were measured on all inputs, and stereo separation was normal. Input sensitivities were sensible with no loading anomalies. The frequency response showed some mild bass lift below 50Hz on all inputs, but this is considered relatively unimportant, and the extreme treble was sensibly rolled off. The output impedance of tape outputs is low and has a maximum output of 9.33V. Good supply mains rejection is shown in the spectrogram.

SOUND QUALITY

The AX500 rated a solid 'good' via analogue disc inputs, showing considerable competence in all departments. Moving magnet was marginally better than moving-coil. But the latter should not be dismissed as an afterthought, as is sometimes the case with mid-priced integrated amplifiers, and in fact most of the analogue listening was through this input. The stereo staging was quite good, with a fair measure of atmosphere, depth and ambience, and well judged width and focus. Both bass and treble sounded quite good, and the almost 'creamy' textured midrange was another good point - nicely balanced and lacking electronic hardness or glare.

The CD input was well matched to the others, showing only a small uplift in quality and so testifying to the sound design of the RIAA circuitry. The smooth midrange remained a good feature, while the bass could have shown a touch more speed and slam, but was quite good nonetheless. The stereo image showed good clarity and worthwhile depth.

The treble sounded open and sparkling, with just a hint of 'grain' - not enough to be really obtrusive or fatiguing, however. The continuous loudness control was liked, giving a better effect at low volume settings than most such attempts. Driven hard, the AX500 remained in control, with good adverse load driving ability.

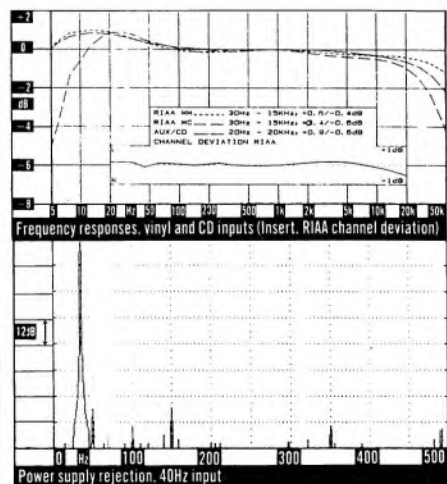
CONCLUSIONS

This £200 integrated amplifier was built and finished to high standards and should offer a long troublefree life. The output power reached 120W per channel, and was also tolerant of a wide range of loads. Well rated on lab results, it also scored a creditable 'good' in the listening tests. Taking into account the versatile facilities, offered without apparent compromise to the overall performance, the AX500 constitutes good value and deserves recommendation.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec		85W (= 19dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.5dBW	21.45dBW	21.4dBW
Both channels, 4ohm load	18.3dBW	18.4dBW	18.3dBW
One channel, 2ohms, pulsed	-dBW	20dBW	-dBW
Instantaneous peak current		+23A	-23A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux/CD in.	-80dB	-80dB	-72dB
Intermodulation, 19/20kHz, rated power, aux input			-72dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-76dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-76dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-75dB
Disc (mc) input (1HF, CCIR weighted)			-65dB
Aux/CD input (1HF, CCIR weighted)			-75dB
Residual, unweighted (volume control at min)			-75dB
DC output offset		left 30mV, right 56mV	
DC offset, pre-amp		left 0mV, right 0mV	
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (1HF)	31.4dB	30.7dB	27.0dB
Disc (mc) input (1HF)*	45dB	43.4dB	39.6dB
Aux/CD input (1HF)	>23dB	>23dB	>23dB
Stereo separation			
Disc input (mm)	68dB	72dB	45dB
Aux/CD input	69dB	72dB	54dB
Output impedance (damp)	0.26ohm	0.22ohm	0.25ohm
Channel balance, disc, at 1kHz			0.47dB
Volume/balance tracking			
Aux/CD input	0dB	-20dB	-60dB
Aux/CD input	0.07dB	0.12dB	0.42dB
Input data			
	socket type	sensitivity	loading
Disc (mm) input	Phono	0.285mV	43kohms
Disc (mc) input*	Phono	0.0187mV	230ohms
Aux/CD input	Phono	16.8mV	30kohms
Output, pre-amp (tape)		9.33V max.	300ohms
Disc equalisation error, 30Hz-15kHz		+0.4dB, -0.6dB	
Size (width, height, depth)		43.5x13.3x33.3cm	
Typical price inc VAT			£200

*See text



YBA 2 PRE & POWER

PRESENCE AUDIO, THE OLD POSTHOUSE, PLUMMERS PLAIN, HORSHAM, W. SUSSEX. TEL: (0403) 76777.

RECOMMENDED



These relatively expensive separates come from Phlox Electronique of France, from the same designer as the well regarded Vecteur range of cables. Recently introduced into the UK the power amplifier is rated at 70W and 140W into 8ohms and 4ohms respectively, while the pre amplifier is 'straight line', no frills design with separate volume control for each channel.

The pre-amplifier is attractively housed in a grey anodised all aluminium case finished to the highest standards. A row of toggle selector switches is uniformly spaced on the front panel, alongside a separate 'direct' switch.

The back panel inputs are high quality gold plated phono sockets, with the disc inputs spaced to accept the dedicated 'Vecteur' moving-coil input transformer. (The standard vinyl disc input sensitivity is for moving magnet cartridges.) Other inputs are available for tape, CD, and 'aux'. No on/off switch is included, the pre-amplifier being 'on' as soon as it is connected to the mains.

Internal construction is to a high standard using selected metal film resistors, polypolyene capacitors, and no fewer than 16 top quality 4,700µF electrolytics, all of which are mounted on a double-sided printed circuit board. The DC coupled disc amplifier uses discrete transistors as the active elements. The line amplifier is contained in a separate screened box.

The power amplifier comes in a matching case, equally well finished but with a small power switch and indicator on the front panel. Finned heatsinks adorn the entire height and length of the side panels. On the back are high quality phono sockets for the signal inputs and 4mm sockets for the speaker connections. The same high quality components are used to construct this 'double mono' (albeit using a shared transformer) symmetric, low feedback, short signal path design, which uses 4 complementary bipolar T03 output transistors. These are mounted using mica with a grounded copper interface, a technique which is claimed to limit heatsink capacitive effects on transistor operation.

Both pre- and power amplifiers are supported on three rigid mounting feet providing some mechanical grounding, which may help negate vibration effects. Other neat touches in both units include thermally con-

nected transistors, and vibration damping material attached to important components.

LAB REPORT

The power specification was easily exceeded into 8ohms, but with some reduction at 20kHz into 4ohms. While the amplifier performed well at low to mid frequencies, slew problems occurred on the 20kHz test and only 13.5dBW was recorded for 1 per cent distortion. A respectable 18.5dBW was achieved on the 2ohm pulsed test and the peak current capability was a comfortable $\pm 24A$.

The pre-amp displayed low distortion and very good noise figures. DC offset was low and input overload adequate. Stereo separation was fine and sensitivity and loadings were well chosen, especially if the pre and power amps were used together. Some mains hum was present on the disc input, and removal of the power transformer to a separate case could perhaps be a help.

SOUND QUALITY

The 'direct' or bypass switch should be engaged for best analogue disc results, otherwise we found stereo focus noticeably phasey. At the expense of mild hum, the disc input gain was sufficient for some m.c. cartridges to be used direct, bypassing the admittedly slight losses incurred with the optional m.c. input transformer (a recommendable device in its own right).

The pre-amp alone majored on space and depth, with a most revealing sense of transparency and ease. Tonally the mid was excellent, and bass and treble simply very good! Stereo focus was also very fine, and performance was improved still further *via* CD, where it ranked with some of the finest pre-amps up to double its price. There was a slight 'slowness' in the bass, but otherwise the sound appeared musical and dynamic, transparent and spacious.

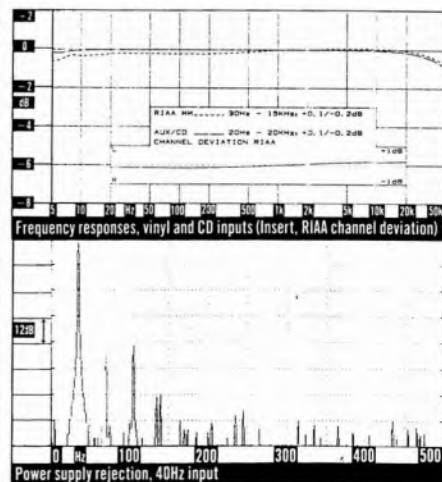
The 2 power amplifier's performance was fully commensurate with that of the pre-amp, again showing that marginally soft bass but with a first rate mid and treble performance. Subtle on low level detail, it was dynamic on the powerful sections and consistently well focused and finely staged. This first rate performance was maintained into the more difficult loads and at high subjective volume levels - it sounded generous and powerful yet never hard or fatiguing.

CONCLUSIONS

This combination of YBA's smaller separates has done very well in review, with a build, finish and performance comparable with products costing twice or three times the amount. Either together or as separates these two products may be enthusiastically Recommended, with the hope that more attention will be paid to mm disc hum performance.

TEST RESULTS

Power output		Integrated amplifier	
Rated power into 8ohms, maker's spec	70W (= 18.5dBW)		
Power output	20Hz 1kHz	20kHz	
One channel, 8ohm load	20.6dBW 20.7dBW	20.3dBW	
Both channels, 4ohm load	19.1dBW 19.1dBW	13.5dBW	
One channel, 2ohms, pulsed	-dBW 18.5dBW	-dBW	
Instantaneous peak current	+25A	-24A	
Distortion			
Total harmonic distortion, at rated power, aux/CD in.	20Hz 1kHz	20kHz	
	-70dB -69dB	-53dB	
Intermodulation, 19/20kHz, rated power, aux input			-68dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			-56dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			-60dB
Noise			
Disc (mm) input (1HF, CCIR weighted)			-79dB
Disc (mc) input (1HF, CCIR weighted)			-75dB
Aux/CD input (1HF, CCIR weighted)			-82dB
Residual, unweighted (volume control at min)			-85dB
DC output offset		left 7mV right 74mV	
DC offset, pre-amp		left 0mV right 0mV	
Input overload	20Hz 1kHz 20kHz		
Disc (mm) input (1HF)	23.8dB 24.3dB 15.2dB		
Disc (mc) input (1HF)	>24dB >26dB >20dB		
Aux/CD input (1HF)	>23dB >23dB >23dB		
Stereo separation			
Disc input (mm)	69dB 66dB 42dB		
Aux/CD input	70dB 73dB 47dB		
Output impedance (damp)	0.08ohm 0.09ohm 0.12ohm		
Channel balance, disc, at 1kHz			0dB
Volume/balance tracking	0dB -20dB -60dB		
Aux/CD input	n/a dB n/a dB n/a dB		
Input m.a.a.	socket type	sensitivity	loading
Disc (mm) input		1.58mV	56kohms 80pF
Aux/CD input		83mV	53kohms 170pF
Power amp		120mV	28kohms 140pF
Output, pre-amp (tape)			7.7V max. 22ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, -0.2dB
Size (width, height, depth)			43.0x7.4x36cm
Typical price inc VAT			£1395 + £1695
			(m.c. transformer £299 extra)



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AMPLIFIERS TECH TALK

Here we explain the methods and relevance of the various lab tests and approach used in the subjective assessment.

LABORATORY TESTS

In general the tests conform to IHF A202 practice which makes comparison between units straightforward. Where possible, dB rather than percent of linear scaling is used, which again makes comparison of performance rather easier.

OUTPUT POWER AND CURRENT

Output power is referred to output level, on the basis that a good amplifier represents a voltage source. Zero reference, 0dB, is equal to 1W, that is 2.83V across the standard 8ohm load. The scaling of level is not adjusted in power terms to account for the various load regimes, however. The objective is to explore the 'stiffness' or load tolerance of the amplifiers, and the theoretically correct addition of 3dB for 4ohms and a further 3dB for 2ohms only serves to confuse this fact.

Accordingly, the output level was examined for 8ohms, one channel driven to less than 1% clipping distortion, as well as with 4ohms into both channels driven and into 2ohms pulsed, 20Hz to 20kHz.

A further test served to explore momentary peak, current capability and its symmetry. To achieve this a 1ohm (or when necessary 0.5ohm), load was used. Short pulses of 1kHz repetition rate are used here, current excursion being read from an oscilloscope trace. The peak current figures should be judged with some discretion since the required capability must logically depend on the available power rating as well.

TOTAL HARMONIC DISTORTION

The figures recorded for total harmonic distortion include the noise within the measuring bandwidth of 400Hz to 80kHz, and for the 20Hz results they also include hum. The amplifier is set with one channel driving 8ohms to rated output, and the results provide a check on sample quality and give a general idea of linearity.

INTERMODULATION DISTORTION

This is a more sensitive indicator of performance. The test is carried out with 19kHz and 20kHz input frequencies, the sum of the difference tones being recorded using an HP3561A spectrum analyser with a resolution of 115dB. Where no products were visible the result is given as better than 110dB. *Via* auxiliary input the peak composite input level was 1V, *via* moving magnet 200mV, and *via* moving coil 20mV. These are strong signals but are within the normal expected dynamic range.

SUPPLY MODULATION

This test assesses the supply rejection of the amplifiers under load. Run at two-thirds of their rated output level, with a 4ohm load, a spectral analysis was made from 0-500Hz to assess the degree of supply hum modulation and breakthrough to give a sort of 'mud' index.

NOISE

An average of left and right channels was recorded, with the input appropriately loaded - for example, with equivalent cartridge sources for mm and mc (200ohms, 100ohms). The noise contribution of the termination has been deducted, leaving weighted CCIR/ARM readings. Residual noise was also noted over a 20Hz to 20kHz bandwidth, with the volume control at zero.

DC OFFSET

This was measured with inputs terminated and when the equipment was well warmed up.

INPUT OVERLOADS

These referred to IHF input levels of 0.5mV for mc, 5mV for mm and 500mV aux at 1kHz. Note that for practical purposes the maximum recorded disc modulation remains pretty constant above a few kHz. In consequence an amplifier does not require a much increased disc input overload at high frequencies. More than 15dB at 20kHz will be ample for disc headroom.

Input overload for auxiliary/line input was also checked; if it

exceeded 20dB (5V) >20dB figure is recorded.

CHANNEL SEPARATION

Using a sensitive spectrometer, stereo channel separation was measured with the inputs terminated.

OUTPUT RESISTANCE (DAMPING FACTOR)

At 0dBW a 2ohm load was applied and the drop from open circuit output voltage noted. This loss represents the amplifier output resistance and is converted to ohms. The notion of damping factor is considered irrelevant in the light of cable and loudspeaker resistance.

DISC SENSITIVITY

This and the other sensitivities were measured using a computer DVM to compare input and output voltage at a decent signal-to-noise ratio, providing the voltage gain. This is converted to IHF sensitivity for a rated 0.5V in the case of a pre-amp, or to a 0dBW output for a complete amplifier.

INPUT IMPEDANCE

In general these were checked using an automatic RLC bridge, but where the input conditions (biasing, overload etc) gave erroneous results, the loss produced *via* 600ohms source resistance was computed to a loading factor for 1kHz and 20kHz.

DISC EQUALISATION

For moving magnet this was measured using an HP200 computer *via* reference to a table of exact RIAA equalisation values which were then used to plot the final curve. A 600ohm source impedance generator (60hm m-c) was employed, representative of a cartridge source; hence some high frequency loss would be experienced in the response where substantial input capacitance was present, as the case with a real cartridge.

GENERAL APPRAISAL

In addition to the above lab tests where practical the products were opened up for an engineering design appraisal as

well as an assessment of safety and constructional quality.

LISTENING TESTS

A two-tier system of listening tests was employed, whereby the procedure was divided into two parts. A/B full blind listening was found to be impractical for all the models in such a large scale project. Instead, using listening techniques developed by the author and his assistant, the products were carefully assessed on an individual basis. Many of the products were subjected to repeat assessments, and a number were monitored under blind conditions to ensure that the panelists were not subject to significant errors or prejudice.

Key factors involved in arriving at satisfactory judgements included the author's personal experience of over 200 models over the past two years; the use of an acoustically controlled and neutral listening room; ancillary equipment of good accuracy, and the use of both analogue and digital programme. Typical listening levels were around 95dBA, which was within the compass of the smaller models. Following analytical auditioning *via* the disc inputs, (both mm and mc where applicable) and the auxiliary input, the amplifier's volume was increased to the onset of audible distortion under two conditions, namely on '8ohm' speaker load and a '3ohm' simulated speaker load. Peak programme power levels were also monitored to assess the adverse load capacity.

Where the pre- and power-amps from a given manufacturer could logically be separated, these were assessed individually.

The latest 1988 auditioning mainly involved using special bi-wired Celestion SL600s on Cliff Stone π stands, with various exotic Van den Hul cables. Sources were Pink Triangle PT Too, SME Series V and Van den Hul MC One, and Cambridge Audio CDI. Reference amplification included Cello Audio Suite (premium) and Krell KMA100 II, and a broad range of material, from Grandmaster Flash to Vivaldi was used.



AMPLIFIERS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

Here Martin Colloms and Chris Bryant sum up the best of a very good bunch.

Attempting to integrate the results of earlier issues with this new group has proved something of a struggle. Almost a year has passed since the last amplifier report, and our results show that the intervening period has seen significant improvements in sound quality. CD has acted as a stimulus by focusing attention on small but valued differences between players – differences which are also directly relevant to amplifiers. CD has also stimulated significant growth in amplifier sales, and heightened the consciousness of amplifier sound quality. The significant upgrade in overall sound quality over the last year has resulted in many new Recommendations and Best Buys this time round, so a major revision of our ranking scheme has been undertaken.

INTEGRATED AMPLIFIERS BEST BUYS

The models listed below (in ascending price order) offer excellent value for money, with power, facilities and sound quality all increasing more or less in proportion to cost. The Best Buy price ceiling for this issue is £350.

The **NAD 3020E** (£110) is the current version of this classic budget model, and has surprisingly healthy power reserves. The **Rotel 820A** (£125) is similarly equipped with tone controls, and now provides an impressive standard of sound quality for the money. The **Mission Cyrus One** is just undergoing replacement, as is the no-frills high performance **Rotel RA820BXII**, both favourites in earlier projects. In the same price bracket, the latest **QED 240CDII** (£170) proved to be a nice redesign both inside and out.

Moving up to £200 brings in the moving-coil inputs, so widening the choice of pickup cartridge. An obvious contender is the **QED 240SAII** (£220), with its Super Analogue disc input and dependable all round performance, alongside the **Cambridge Audio P40** (£200) and the new **Creek 4140** (£200). All three offer top class stereo sound for the price, with healthy

sound levels and good load tolerance. At a small further price increase the latest **Musical Fidelity A1** (£250) is outstanding sonically if not in terms of power output and load tolerance.

Increasing expenditure brings further refinement in the moving coil performance, plus increased power. The **Rotel RA870BX** (£325) is a clear example, being a well balanced and versatile allrounder, with high power output and solidly good sound. Star of the issue, however, is the **Musical Fidelity B200** (£300), which is moderately cool running by MF standards with high power but only average load tolerance. It includes fine m-c and mm inputs and very good sound. In the same price region is the well established and excellently built **Audiolab 8000A**, (£325) with tone controls which can be used without an audible loss of fidelity.

RECOMMENDED MODELS

Falling a little short of the Best Buys in terms of price versus sonic performance in our judgement, these eminently worthy models are again listed roughly in ascending order of price, facilities and performance – both output power and sound quality.

In the lowest price band the **Denon PMA250E** (£125) is updated to now 30W/channel. Competent companions include the **Yamaha AX300** (£120) the **Sansui AUG IIX** (£130) the **Marantz PM26** (£110) and the **Kenwood KA 500** (£130), the latter unusual in coming with a worthwhile m-c cartridge input.

At the next price break the established **Arcam Alpha** (£150) and **Creek 4040** (£145) are joined by the new **Marantz PM35** (£160) and **Pioneer A331** (£150), the latter demonstrating much better sound quality than its predecessors.

A good moving-coil facility becomes commonplace at the £200 level, with good value from the following versatile contenders: the **Technics SUV55A** (£200), the **Yamaha AX500** (£200), and the **Harman**

Kardon PM640Vxi (£225). The mm-only **Naim Nait** (£258) is a well established favourite, but a design revision is expected here soon.

Continuing up the price ladder the new **Technics SUV85A** (£350) a worthy high power version of the 55A and also the **IncaTech Claymore** (£350), a good British allrounder. Another UK newcomer, the **Orell SA-040** (£360) is essentially recommendable, but with minor reservations concerning our early sample.

Topping the integrated amplifier bill is the current **Musical Fidelity A100** (£440), still running hot but providing a more than generous standard of sound quality – who needs separates when an integrated can sound like this?

WORTH CONSIDERING

The following models delivered respectable performance, but in our view don't quite match the Recommended models at the same price levels.

At £200 or so, and lacking moving-coil cartridge facilities are the powerful **Sansui AUG30X** (£199) and the **Lux LV100** (£205). The **IncaTech Dirk** (£210) is a strong performer too but in this case is limited to two line inputs only.

Moving up the price scale, the respectable and well equipped **Arcam Delta** (£330) has a good m-c input and may be considered the big brother of the **Alpha**. Another respectable and versatile model is the **Harman Kardon 655Vxi** (£450). The **Philips FA860** (£240) and **FA960** (£285) both deserve honourable mention as competent, well balanced allrounders, and mark a significant return to quality amplifiers by this electronics giant (albeit *via* their Japanese manufacturing acquisition).

RECOMMENDED SEPARATES

Given our policy of recommending products that achieve a certain high standard irrespective of price, plus a reluctance to award Best Buy ratings within the separate pre-

power sector, the following list becomes a little unwieldy, so for convenience is broadly grouped according to transistor or valve operation, each working through at steadily rising prices, with some manufacturer's ranges covered together. We have also included items which have not been formally reviewed, but of which we have some subjective experience. The valve/transistor split does not imply favouritism for one or the other approach, but acknowledges the 'differentness', both subjectively and practically; note also that the valve items do not include moving coil cartridge compatibility as a matter of course.

Almost budget separates are now available from **Rotel**. The **RC850** (£119) pre-amp and the **RB850** (£130) make a fine combination at a low enough price to merit Best Buy rating, the latter a particular bargain comparable to many much more expensive alternatives.

Three British transistor systems provide middle market contrast. The **Audiolab 8000C/P** (£275/£450) gives traditional facilities, good transparency and generous power output. The **Cambridge Audio C75/A75** (£259/£279) is exceptional value for money having a simple, quality pre-amp and generous power output at a quite modest price. The **Exposure VII/VIII** (£316/£309), with our preference and formal recommendation primarily for the power amplifier, is unusually presented with fine build and the provision for pre-amp upgrading.

The **Musical Fidelity** separates range is increasingly extensive, and is strongly recommended in isolation or combination. The **Preamp 3** (£300) and **MVT III** (£1,200) continue to set a high standard at their respective price points. The **P140** (£299), **P270** (£1,200) and **A370** (£2,200) are 'double mono' power amplifiers moving steadily up the power and quality scale. The latest MF products all demonstrate significant improvements subjectively.

In contrast, the **Naim Audio**

separates range should only be used in combination and carefully matched system. **NAC 32-5** and **'42-5** pre-amps (£425/£262) with **SNAPS** or **HICAP** supplies (£212/£285), plus **NAP140**, **NAP250** and **NAP135** power amplifiers (£414, £959, £966) have a distinctly 'different' sound quality which is not to all tastes but has many loyal adherents (including the Editor), with logical consistency and upgrading paths within the range.

The **Albarry 408II** monoblok power amplifiers (£600 per pair) make a welcome return, scoring respectably in the tests and visually distinctive to boot. Much the same may be said of the pretty, and sonically quite similar **Meridian 205** monoblok power amplifiers (£790 a pair), while the **201** pre-amp (£550) set a very competitively high standard for the price, and may also be remotely controlled *via* an optional system handset. (House system control is also possible from this advanced product).

Amongst imported items, the US manufactured **PS Audio PS4.5** (£695) is a fine pre-amplifier with good 'speed' and transparency. The French **Nuance/Plenitude** combination

(£795/£795) is sweeter and softer, with our preference for the power over the pre-amplifier. At higher prices our findings on the **DNM** pre-amplifiers (from £1,000) are rather out of date; despite being a little expensive, recommendation presumably remains appropriate.

At the top end of the transistor price spectrum, a new entry from France is the **YBA 2** separates pair (£1,400, £1,700) which did very well in auditioning. The **Deltec DPA100S** (£1,900) is an expensive but fine power amplifier from Wales. And in a price group all on its own, the **Cello Audio Suite** is a totally flexible and extravagant pre-amplifier system that provided a fine reference point throughout the tests. And amongst the extensive **Krell** range, our preference is for the larger power amplifiers, particularly the **KMA 100II** monobloks (£5,900/pr).

The valve amplifiers will be covered in more detail next month. For the once, the ladder starts with a variety of UK items. The **Croft Super Micro/Series IVS** (£250/£730) is a typically sweet-sounding combination. The **VTL Minimal** (£300) and **Standard** (£500) are alternative pre-amplifiers, while

recommended power amplifiers in the same general price bracket are the **Beard P35** (£695) and **Radford STA25 Renaissance** (£977).

The £995 **Beard 506** is a largely successful attempt to produce a full feature valve pre-amp with built-in m-c transformer, while the £1,775/pr US monoblok **Quicksilver** power amplifiers remain recommended. Also from the USA, the **Counterpoint** range continues to provide above average power in a valve 'hybrid' configuration with the **SA12** (£1,250) and **SA20** (£2,350) power amplifiers, while the **SA7** pre-amp (£747) still merits consideration.

Amongst the real US valve (increasingly 'hybrid') exotics, the extensive Audio Research range continues to set the pace, matched at most price points by alternatives from Conrad Johnson.

Our main **Audio Research** recommendations are for the **SP10** and **SP11** pre-amplifiers (£2,850/£5,150), plus the **D115II** (£3,331), **M100** (£2,850), **D250II** (£6,950) and **M300** (£4,998 each) power amplifiers, covering stereo and monoblok ranges.

The **Conrad Johnson**

Premiere Three (£3,400) pre-amp could combine with **Premiere Four** (£3,600) or **Premiere Five** power amplifiers – or the cheaper **MV50** (£1,795) for that matter.

WORTH CONSIDERING

Besides those mentioned above, many other separates remain worth considering. In many cases these are derived from older reviews and assume that the product has not changed significantly, whereas in practice many manufacturers follow a policy of continual improvement, so some may well have merited full recommendation had our experience been more up to date.

Availability has been assumed, but may be limited in some cases. Transistor combinations include the remote control **Linn LK1/LK2** (£800), the exquisitely finished Burmester **838/846/850** (£990/£1,050/£2,650/pr); the **Quad 34/405** (£600), plus the **Robertson Forty Ten** (£1,000), and presumably the latest version of the **Krell KSA50** power amplifier.

Valve components include the **VTL 50 Watt** (£1,150/pr), **Beard M70** (£1,595/pr) and **Audio Research D70II** monoblok power amplifiers.

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

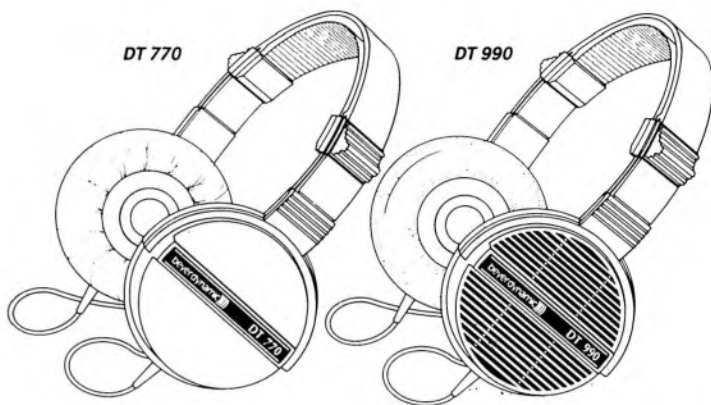
Perhaps we could persuade you that it will go nicely with other status symbols, like your Porsche.

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

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unique technology used to achieve the very low mass of the diaphragm and moving coil assembly (only 20% of that found on a typical competitor's headphone), results in an exceptionally transient response and a reduction in the non-linear distortion, qualities normally found only in the best electrostatic headphone.



The DT 770 closed headphone combines the latest transducer technology with a unique bass reflex system. This achieves a superb bass response with well defined sound image, plus excellent pulse characteristics.

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You must hear them to appreciate their real value. You just can't compare them to anything else, simply because there's nothing else quite like them. So get down to your Hi-Fi specialist and listen to the new Beyer DT 990 or DT 770.



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

Need you hear more.





CHOOSING AND USING . . . CASSETTE TAPES

The blank audio cassette market in the UK is surprisingly both stable and valuable – some £100m per year being a widely accepted estimate, with slight growth predicted.

To the relief of established manufacturers, audio tape has proved impressively resistant to the invasion of cut price brands, in direct contrast to the videotape situation. But to their irritation, the UK stubbornly refuses to pay premium prices for premium tapes: UK chrome and pseudochrome Type II penetration is amongst the lowest in Europe, and ferric Type I still dominates sales.

Welcome news for consumers and trade alike is that the plan to introduce a levy to compensate for alleged copyright theft has gone back on ice for the umpteenth time. No-one can deny the moral case of copyright owners, but the practicalities are full of difficulties. And the irony is that those who perpetrate such theft tend to be amongst the heaviest consumers of pre-recorded music in any case.

The UK market is dominated by TDK, who have held onto 40+ per cent for as long as anyone can remember. The other main brands that jockey for position are BASF, Sony, and Maxell, plus Agfa, Fuji, and Memorex. Some specialise in independent outlets, others in particular chains, but all bar BASF (currently re-launching) are included in our tests, along with a number of hopeful aspirants.

Choosing the right tape or tapes for your particular circumstances need not be too arduous a task, particularly with the help of our detailed reviews. Start by making an honest appraisal of those requirements. As a hi-fi user you may decide to use good Type II tape without noise reduction for most purposes, falling back on cheaper but decent quality Type I tape from time to time, and perhaps using metal/Type IV for occasional live work.

While our tape tests can suggest where to start looking, they can't do anything about the alignment and condition of your particular cassette recorder. Our test recorders were all carefully

set up before tests began, and some hi-fi dealers are able to offer a similar service to their customers. But experience shows that few consumers bother with such niceties, so the alternative DIY strategy involves that age old technical tweak – suck it and see.

Trying out several different tapes in your own recorder is really the only reliable way of finding the best combination of deck and tape, and hence selecting the right tapes for particular purposes. But having gone through this (admittedly rather tedious) procedure, you will find our reviews can point the way to various alternatives.

Even though many consumers stay loyal to a particular brand, there are lots of temporary special offers around on one brand or another that can offer significant savings for the informed purchaser. And if there is one thing that makes sense when buying blank audio tape, it is to pay as little as you can get away with for the performance you want.

TECH TALK

In the comprehensive series of tests that follow, what you will *not* have learned is how well tapes will resist the ravages of life on the road, how much high frequency energy is lost as a result of ageing processes (there are several), how much like the tape you buy now the one you buy in six months time will be, how smooth the tape surface is (and how rough it needs to be), how dropout increases with time and usage . . .

Partly for these reasons, some of the easier and more facile judgements have been avoided. A tape may have a response shape that looks like a mountain in profile, but this isn't necessarily bad unless left uncorrected. The tape, which otherwise might sound very thin and bright, may be correctable using a tape tuning system or a single fine bias adjust knob of the kind that graces many modern cassette decks. Similarly, if a tape has a high noise floor, this is a Bad Thing, but if it has a high noise floor *and* a high operating ceiling, well that isn't so bad at

all, as long as the cassette deck can handle the hottest signals the tape can accommodate. What really counts therefore is the available dynamic range, because it is an absolute that will be apparent in one form or another on all tape machines.

Dynamic range can be inferred from the noise and overload performance data, but the spectrum analysis plots give much more useful data, which can be assessed in relation to the usual distribution of energy within music. It has become fashionable to assess tapes for their headroom near 20kHz, but this is quite unrealistic, and we have chosen to use a repeatable test signal which closely mimics the energy distribution found within music – the shaped random noise known as pink noise.

Of course there have to be standard tapes. For this project we chose to use the alignment tapes used almost exclusively within the manufacturing industry: *AC-713*, *AC-513* and *AC-223*. They are manufactured by TDK, employ calibrated *AD* (Type I), *SA* (Type II) and *MA* (Type IV) stock, and for the most part correspond to IEC standards. Sensitivity figures, responses and so on are referred to these three tapes.

Equipment used for the tests included a Nakamichi *Dragon* recorder, courtesy of B&W/Nakamichi, and a variety of test equipment such as a Hewlett Packard *3580A* spectrum analyser, a Nakamichi *T-100* test set and Neutrik generator, chart recorder, filter, sync modules and so on.

Sensitivity: measured at 400Hz, and compared to IEC reference level. Unusually high or low figures could result in Dolby mistracking unless the sensitivity of the cassette deck can be adjusted.

Noise: this is the DIN Peak weighted signal/noise figure, referred to 250nWb/m (+2dB on the Nakamichi *Dragon* record level meters).

Distortion: THD, measured at the same point.

3% THD: expressed in dB, indicates the number of dB headroom above IEC 0dB for 3%

distortion at 400Hz. In some cases (notably the metal tapes), there wasn't enough gain in the system to achieve 3% distortion. In these cases the level is shown as >10dB.

Saturation: measured at 40Hz and 4kHz, this figure shows the level expressed in dB above 0VU at which the tape saturates, that is fails to respond to any further increase in signal level. Near saturation levels the music signal undergoes high levels of compression with consequent inability to track volume changes.

Noise Modulation: with a test 3150Hz signal at 0VU, this figure represents the integrated level of noise in the range 3000Hz-3130Hz. Mod noise is a complex mechanism primarily associated with tape jitter which results in unwanted sidebands which defocus and smear the sound.

Compression: measured at a very high frequency (10kHz). This test numerically represents the ability of the tape to replay treble volume changes accurately. The lower the figure the better, since a high figure represents significant compression.

Frequency responses: a spectrum analysis and two swept sinewave frequency responses were run with each tape. The spectrum analysis (not reproduced) shows, separately, the bias noise floor of the tape, and the output of each tape driven moderately 'into the red' (by 3dB) using a wideband quasi-music pink noise signal. This kind of signal stresses tape differently from the more common sinewave signal (a fact which underpins Dolby *HX Pro*), and the test is designed to give an idea of where the edges of the operating envelope of each tape lie. The plots are not reproduced, but are referred to in the text of the reviews.

The frequency response runs, which are reproduced, show separately the sinewave frequency response of each tape, both conventionally at -20dB and also at 0VU. The difference between the two gives a good idea of how tapes modify the frequency and level distribution of dynamically changing signals – music in other words.

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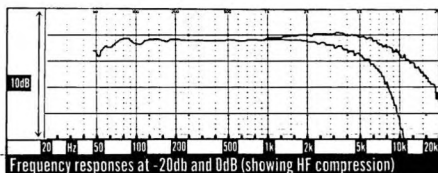
AGFA F-DX1

Agfa's promotional literature describes this new tape as being 'ideal for everyday use' with 'low background noise and balanced dynamics in high and low tones'. Which to those practised in the ancient art of promotional doublespeak is proof that even the manufacturer only sees this as a low cost 'cooking' tape, unsuited to high fidelity applications.

And so it is. Modulation noise is particularly poor. Spectrum analysis using a quasi-musical source shows that *F-DX1* has a restricted operating envelope, particularly at HF. The frequency response at normal bias settings is tolerably well extended, but compression is endemic and hiss quite high. However, it's not all bad since the tape can be driven reasonably hard without distress.

Sound quality on the other hand is mediocre. Recordings sounded dull and compressed, with considerable smearing of fine detail and loss of dynamic range. As Agfa themselves suggest, *F-DX1* is best for portables.

Sensitivity: -0.4dB. **Signal/noise:** -46.5dB for 0.9% THD. **10kHz compression:** 4.8dB.

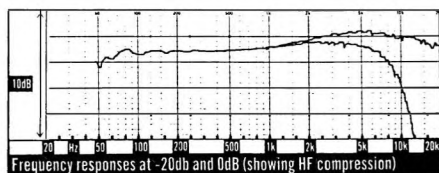


AGFA F-DX1S

F-DX1S is the hi-fi version of *F-DX1*. It comes in a similar very ordinary (and rather creaky) housing, and has a much brighter tonal balance. Curiously, it's also less sensitive than both *F-DX1* and the IEC reference. This combination of brightness and low sensitivity confirms a lack of ideal hi-fi compatibility and suggests that the tape is best used on decks with adjustable bias and sensitivity. However, its tonal balance (if not the lack of shout) does make an interesting proposition for situations (on the road?) where a little extra 'bite' is required.

Bias noise is quite low and HF compression no worse than average (in fact HF dynamic range is a little better than normal), whilst saturation levels are high. The tape can be driven hard without an insupportable loss of musical dynamics. Clarity and detail are well handled by this tape, but the brightness indicated in the laboratory tests was apparent when playing music too - not unpleasantly so, but the balance tended towards 'thinness' and 'leanness'.

Sensitivity: -1.1dB. **Signal/noise:** -48dB for 0.9% THD. **10kHz compression:** 3.8dB.



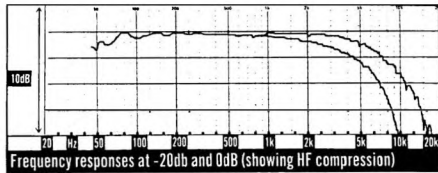
BOOTS FERRIC I

This very inexpensive cassette is fashionably turned out in a totally see-through housing, and appears to be quite well finished. It's promoted as an everyday, no-frills tape, and is particularly aimed at less sophisticated equipment (their words).

The tape nominally offers good hi-fi compatibility, with sensitivity very close to IEC. Noise measures quite low, but this is an artefact of the measuring process, affected by the very early treble rolloff exposed in the frequency response curves: boosting treble to compensate obviously changes matters considerably. Though there's more than enough at normal levels, quite high levels are accepted by this tape without additional compression. Modulation noise is low, and the tape runs smoothly.

However, it didn't fare very well on test. Restricted treble dynamics is one problem, as is the clear lack of top end and also mid-range energy. Ultimately, the sound lacks balls, and subtle detail stands very little chance.

Sensitivity: -0.2dB. **Signal/noise:** -47dB for 0.8% THD. **10kHz compression:** 4.5dB.



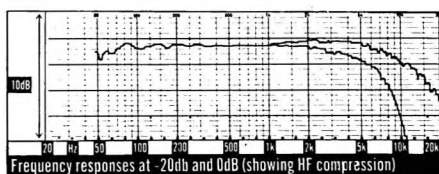
BOOTS SUPER FERRIC I

Boots Super Ferric I has a great deal more HF extension than the 'cooking' *Ferric I*, with predictable consequences on audition. It stays flat to about 5kHz (measured at -20dB), where the cheaper tape started to die not far above 2kHz. Figures for overload and saturation are quite good, the +7dB 3% distortion point being well up to the class average. Modulation noise is quite low, and physical construction is satisfactory.

On paper, noise appears to be worse than the cheaper Boots tape, but the reality is that the extra HF simply lifts the top, noise included, and the tape is in fact acceptably quiet. However, one tradeoff affects sensitivity; *Super Ferric I* is just a little less sensitive than ideal, though not enough to cause serious Dolby incompatibility problems.

Moreover, the treble dynamic range is quite restricted, a finding that had clear consequences. In common with the majority of ferrics, especially low cost types, this tape sounded 'damped' and lacking midrange resolution, even though the top was clean and sharp. A mixed bag then overall, and on balance not particularly good value.

Sensitivity: -0.6dB. **Signal/noise:** -46dB for 0.8% THD. **10kHz compression:** 4.5dB.



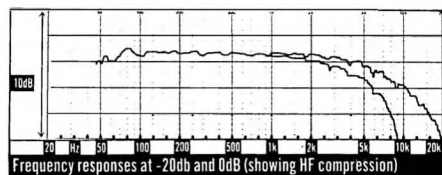
DENON DX

Although now very well known for their high fidelity equipment, Denon remains something of an unknown quantity in this country as far as blank tape is concerned.

Like a number of the less expensive tapes, *DX* comes in a see-through housing, albeit one of higher quality than some, with more (and better designed) tape guides and shell stiffening than usual. The tape inside, however, is disappointing, especially for a company with a particularly strong track record for cassette hardware.

DX is a tape of very restricted dynamic range throughout the audio frequency band. Furthermore, sensitivity is very low and treble extension extremely poor - output starts to wane immediately above 2kHz. To add insult to injury, tape uniformity was suspect on the samples supplied, and the noise was only average despite the sharply curtailed treble. Predictably, sound quality was a bit of a joke. On an IEC aligned tape recorder, loss of precision and air, plus considerable muddling especially with Dolby in circuit, were all abundantly obvious.

Sensitivity: -1.4dB. **Signal/noise:** -46dB for 0.9% THD. **10kHz compression:** >4.0dB.

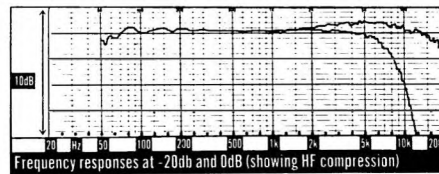


FUJI FR-IS

This average sensitivity tape is Fuji's best stab at the premium ferric market, and is an impressive tape by most standards. High frequency response is unusually well extended, so on many recorders *FR-IS* could sound a little bright. Dynamic range is very good, and the tape can be driven well above the 0VU point without obvious flattening of dynamics. Dolby and IEC compatibility are good.

Although slightly thin sounding, Fuji *FR-IS* made some fine, articulate recordings with a real sense of detail, a sweet, clean treble quality and quite natural dynamics. Mid/top behaviour, where many ferrics come to grief, is a particular strength, and the good treble overload and lack of compression facilitate the greatest prize of all - high quality Dolby-less recordings with (generally speaking) negligible background noise. Even if noise reduction is desired, it should be possible to get away with Dolby B where the more extreme Dolby C might otherwise have been employed.

Sensitivity: +0.2dB. **Signal/noise:** -47dB for 0.9% THD. **10kHz compression:** 4.0dB.



MISSION ELECTRONICS CONTROL CENTRES

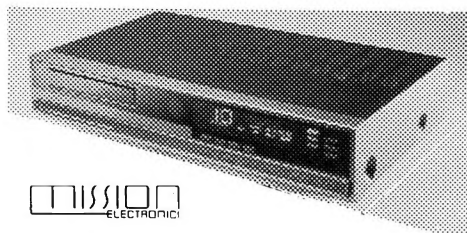


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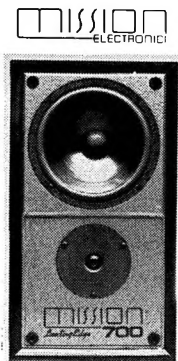
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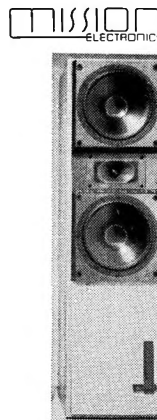
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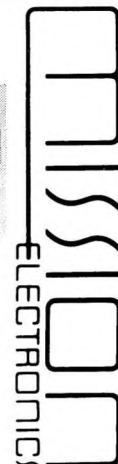


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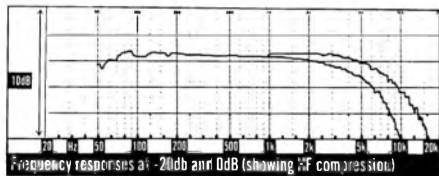
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FUJI DR

Made using cobalt doped *Ferrix* magnetic particles which are produced in-house, Fuji's budget price *DR* tape comes in a conventional but seemingly good quality housing. The tape inside, however, bears a strong (and coincidental?) resemblance to the tape stock used by Denon in their similarly named *DX* tape. Sensitivity is very low, treble noticeable only by its almost complete absence, and the effective dynamic range of the tape is nothing if it is not, well, near nothing. The other numbers are a close match for the Denon *DX* too, and are never better than unremarkable.

It was predictable that this tape wasn't going to top any popularity polls on audition, and so it turned out. Fuji *DR* made dull, compressed and lifeless recordings. Compared to the 'original' (the feed being recorded), the off-tape sound was like listening at a greater distance, with the treble muted and confused. In the manner of long distance listening generally, there was no sparkle to the sound at all. The bass sounded prominent but heavy and lacking in transient attack.

Sensitivity: -1.6dB. **Signal/noise:** -48dB for 0.9% THD. **10kHz compression:** 3.6dB.

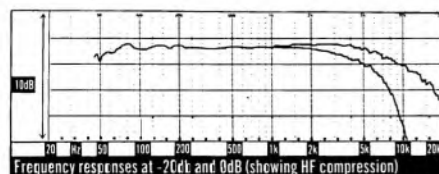


GOLDSTAR HD

Goldstar, a new brand to the UK, is manufactured by Lucky Goldstar International, a trading title of such monumental tackiness it could only have been bestowed by Korean principals. The tape itself is visually undistinguished, some details of finish looking a little below par. However, winding performance was good with minimal noise and limited edge scatter during fast wind operations.

HD, one up from the bottom of the Goldstar range, is of slightly lower than average sensitivity, and is moderately hissy too. HF compression is on the high side, and the tape's working dynamic range determined from spectrum analysis is well below average. The swept sinewave test shows that the tape is tonally near neutral through the mid-range and lower treble, but a significant lack of HF energy is also apparent. The reality is that *HD* (along with stablemate *HR*) sounds dull and constrained especially when recording high energy material. Clarity is strictly limited by modern standards.

Sensitivity: -0.7dB. **Signal/noise:** -45.5dB for 0.9% THD. **10kHz compression:** 4.8dB.



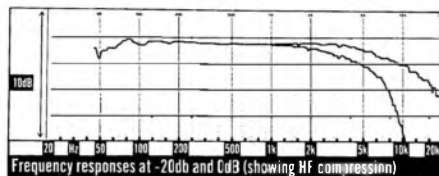
GOLDSTAR HR

Although Goldstar *HD* and *HR* are similar in many ways, including the design of the shell and the basic coating formula, *HR* boasts improvements in magnetic properties resulting in improved saturation performance. Close comparison of the available dynamic range using the spectrum analysis tests shows that *HR* does indeed have greater headroom at high frequencies than *HD*. But the difference is small, of the order of 0.5dB on average, and still leaves the tape trailing well behind the current state of the art, even by Type I standards.

The swept sinewave response also follows the falling top end of *HD* and the other key numbers are similar too, including the low sensitivity (just 0.2dB better than *HD*, which is well within the expected range of batch variability). HF compression was high too, but midband noise was a useful 2dB better.

In practice there was little to separate *HR* from the cheaper *HD*, though there was some suggestion that *HR* was a little cleaner at times. However, it is still a lazy, dull sounding tape, with compressed dynamics and a limited range of tonal colours.

Sensitivity: -0.5dB. **Signal/noise:** -45dB for 0.9% THD. **10kHz compression:** 5.1dB.

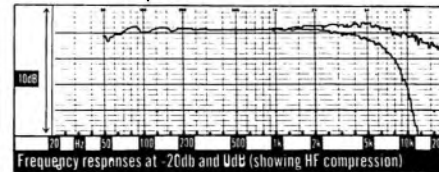


JVC UF1

JVC *UF1* is housed in a well made clear plastic shell, with Braille markings to help with side identification. The tape measures very close to the IEC standard, and should therefore offer wide compatibility. The response shape is flat and extended, and the working dynamic range is wide, though sinewave testing suggests rather high background hiss levels. However, modulation noise is low, and this seems to pay practical dividends. Sensitivity is just slightly higher than normal, but overload margins are extremely high; the tape can be driven very hard without distress. To some extent the noise can be traded off against headroom, so the available working dynamic range is very similar to TDK *AD*, which is good.

Hiss apart, *UF1* is hard to fault. It made very clean recordings with good detail, and unfettered dynamics if the cassette deck itself doesn't overload before the tape. Treble quality is particularly clean and uncluttered, undoubtedly helped by the low modulation noise which is an indicator of very smooth running.

Sensitivity: +0.3dB. **Signal/noise:** -49dB for 0.8% THD. **10kHz compression:** 4.0dB.



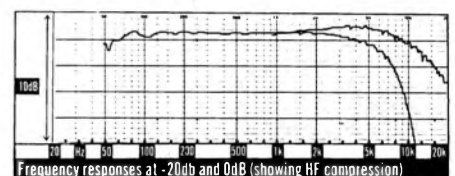
MAXELL UD1

UD1 is a high quality tape based on what Maxell describe as a 'ferricrystal magnetic particle'. It supposedly has higher energy than gamma ferric oxide and is less porous, leading to a smoother surface finish. This very crude description has some backing from the lab tests: *UD1* has higher than nominal output across the range, and the smoothness of the tape is confirmed by the low (but not ultra-low) modulation noise.

The tape is also capable of handling very high energy levels before starting to shut down. The 400Hz 3dB distortion point falls at +9dB, which isn't far off metal tape standards, whilst both *LF* and *HF* saturation gave comparable results.

However, the ability of the tape to soak up wideband energy showed very little advantage over the mean standard for the group as a whole. Sound quality is intrinsically good, but the high sensitivity, combined with a touch of brightness (more heard than measured) makes compatibility rather iffy, and the telltale signs of Dolby mistracking were sometimes apparent. A 'good but ...' tape.

Sensitivity: +0.5dB. **Signal/noise:** -48dB for 0.8% THD. **10kHz compression:** 4.8dB.



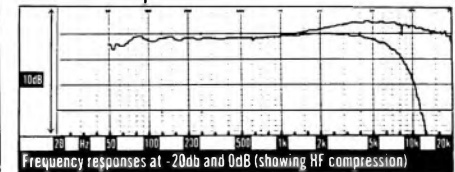
MAXELL XLI

XLI is one of two premium Maxell ferrics, sharing similar, but not identical electrical properties to *XLIS*. *XLI* is packaged in a plainer outer - a standard (but good quality and extremely well finished) shell with the normal, small observation window.

Currently available *XLI* uses Maxell's 'Super Fine Epitaxial' magnetic particles in an improved form resulting in a higher maximum HF output and lower noise. The *quid pro quo* in this case is an obviously bright response that really requires higher than normal bias (or a bias tweaking facility) to give of its best - although its inherent response could act as a palliative for decks that habitually sound dull with ferric tapes.

On the whole *XLI* falls only slightly short of its more expensive brother, and actually has better modulation noise, for example. It also has slightly higher HF headroom and *LF* saturation, but the former is partly a reflection of the response shape.

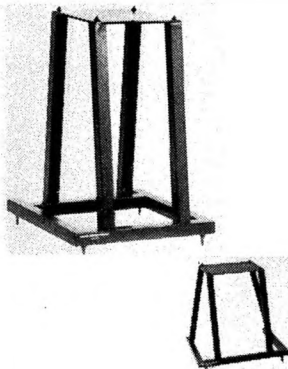
Sound quality is inherently crisp and clear, with excellent articulation and dynamics, and low noise. But the HF peak can irritate, and may result in Dolby mistracking. **Sensitivity:** -0.4dB. **Signal/noise:** -48dB for 0.8% THD. **10kHz compression:** 4.2dB.



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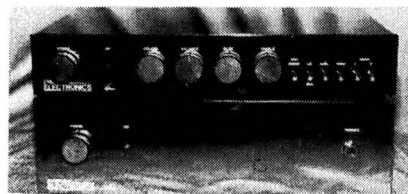
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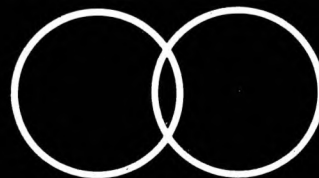
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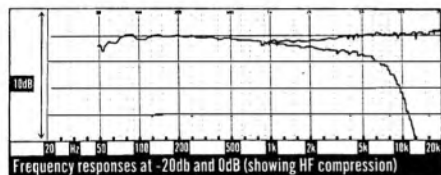
3ADABADABADABADA

MAXELL XLI-S

Compared to its *XLI* stablemate, *XLI-S* is supplied in a more modern looking and better finished housing, has a larger observation window, and Braille side markings. *XLI-S* uses a further refinement of Maxell's 'Super Fine Epitaxial' particles, which here are rather smaller in average size than those used for *XLI*. This helps account for the very good -49dB noise figure, which is backed by good noise modulation, but generally slightly disappointing overload and saturation. Nevertheless, *XLI-S* still has better dynamic range than the class average, especially at HF. It also has a fuller bass and a 0.5dB response dip centred on 1kHz .

Here is another example of a tape which doesn't sound especially comfortable at IEC settings, though it does sound extremely crisp and neutral in the treble especially, and it doesn't sound as bright as *XLI* due to its flatter upper mid/lower treble register. On the whole though, despite all the right resolution and bandwidth ingredients, the tape is uneven in a way that can only be exaggerated by Dolby processing.

Sensitivity: -0.2dB . **Signal/noise:** 49dB for 0.8% THD. **10kHz compression:** 4.5dB .



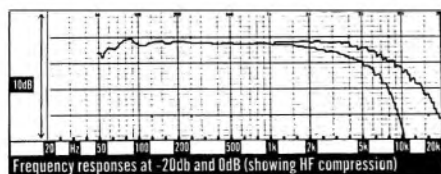
MEMOREX dBS

Although you'd never know it from the presentation, *dBS* is electrically not dissimilar to *dBSI*. *dBS* looks boringly staid and ordinary, though the manufacturer has been thoughtful enough to include Braille markings (one and two dots for the two sides) on the otherwise conventional housing.

Output level (and therefore sensitivity) is pitched a little lower than average, and the response shape is on a rapid downwards slope at high frequencies. The noise figure looks satisfactory, but is in effect assisted by the response shape; the real (corrected) noise levels of these tapes are quite high. As a result the available working dynamic range is limited.

Unfortunately, overload margins are no better than so-so-ish too, and modulation noise is very poor. Not unexpectedly then, the tape typically sounds dull, compressed and 'slugged', with a thickening of detail the most objectionable quality. This dullness makes the tape less than ideal even with portables, but the other side of this coin is that it does at least sound smooth and inoffensive. If that's what you're looking for.

Sensitivity: -0.5dB . **Signal/noise:** -47.5dB for 0.8% THD. **10kHz compression:** 4.5dB .



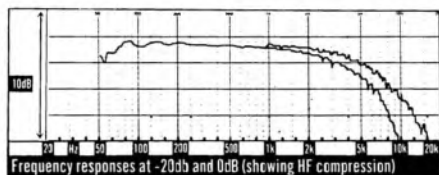
MEMOREX dBSI

This tape is remarkably similar in overall properties to *dBS*, but *dBSI* has completely revamped packaging. It comes dressed (somehow a particularly appropriate term here) with yellow hubs and guides set in a clear housing overprinted with pink and blue shapes. The effect is at the very least colourful and striking – the (surely rather condescending?) idea being to appeal to the female buyer.

On the test bench, however, *dBSI* proved a rather prosaic performer. Like *dBS* it has very limited HF performance, with output declining from slightly above 1kHz (at IEC bias/EQ settings). The operating ceiling over 0VU is also a little lower than average, and modulation noise is unexceptional.

Listening to *dBSI* can be a very pleasant experience, but it's unlikely to be a particularly illuminating one musically. This isn't a high fidelity grade tape, and is clearly best suited to standard utility purposes rather than critical musical ones, where the dull, sluggish and rather hiss-bound character will get in the way.

Sensitivity: -0.7dB . **Signal/noise:** -48dB for 0.8% THD. **10kHz compression:** $>3.8\text{dB}$.



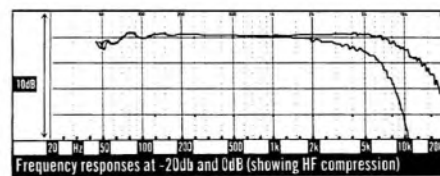
MEMOREX MRX1S

This tape is quite different from the other Memorex ferrics, but it's not a cheap one, encroaching on the chrome price band. Sensitivity is almost bang on the IEC standard, and the frequency response is unusually flat and well controlled, so Dolby compatibility should be ensured.

MRX1S will accept reasonably high levels without risk of overload, but the HF output level did collapse rather sharply at elevated – note the high 10kHz compression figure, which actually measures the degree by which output fails to track input. Tying in with this, the spectrum analysis test, based on a wide-band quasi-music signal at very high levels, showed that the dynamic range window of the tape is a little narrow with this kind of stress. Bias noise (hiss) is also high, which is only partly excused by the well extended treble.

In practice this tape sounded clear, clean and neutral – an excellent result in fact. But hiss was a little high, and dynamics were ultimately restricted compared to the best Type I tapes.

Sensitivity: $+0.1\text{dB}$. **Signal/noise:** -46.5dB for $+0.8\%$ THD. **10kHz compression:** 5.3dB .



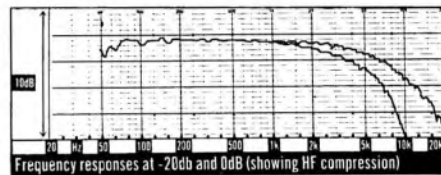
REALISTIC LOW NOISE

Until comparatively recently Memorex was a Tandy brand, but with the ending of that arrangement, Tandy are badging these tapes as their house brand. Realistic tapes (the noun, not the adjective) are made in Korea (as are at least some of Memorex's tapes) and are presented in adequate cassette housings with Braille markings.

Realistic *Low Noise* behaves not unlike the more expensive *Gold Plus* range on test, and it's probable (but by no means definite) that they start life with the same magnetic powder. However, the tapes do have a different colour and a quite different finish, the visually smoother looking *Low Noise* actually turning in a grossly inferior 38dB modulation figure.

The tape has a gently declining HF response, and rather low average output, so Dolby compatibility is decidedly iffy at best. Predicably, therefore, sound quality is lacklustre. There's an absence of sparkle, of tonal variety and of weight and dynamics, whilst the separateness of individual instruments was compromised.

Sensitivity: -0.5dB . **Signal/noise:** -48dB for 0.8% THD. **10kHz compression:** 4.5dB .



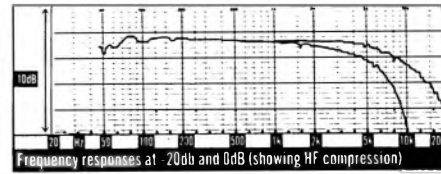
REALISTIC GOLD PLUS

Packaged in a housing similar to the one used by other Realistic tapes as well as some Memorex types (see Realistic *Low Noise* comments), *Gold Plus* turned out to be a below average performer on most counts, notwithstanding the promise of the name. Except on one count that is: *Gold Plus* achieved an almost flukishly good 45dB figure for noise modulation. However, this must be set against a rather poor noise figure (-46dB).

Like too many of its contemporaries, *Gold Plus* offers low sensitivity and limited high level headroom along with quite significant 10kHz compression. All these things combined imply a rather narrow dynamic range, and sure enough this is exactly what was found on the pink noise (pseudo-music signal) tests.

With a slightly depressed top end frequency response, *Gold Plus* is considerably better than *Low Noise*, but still not particularly good by prevailing standards. It shares the usual second-rank ferric character – a rather vague, woolly sound and a lack of real energy and balls.

Sensitivity: -0.6dB . **Signal/noise:** -46dB for 0.9% THD. **10kHz compression:** 5.5dB .





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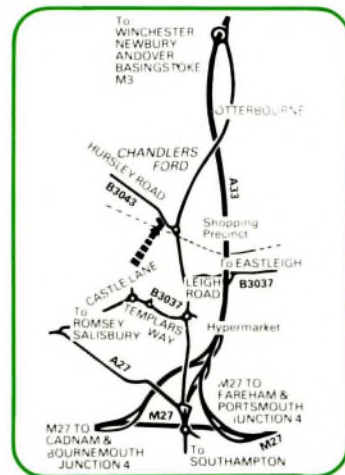
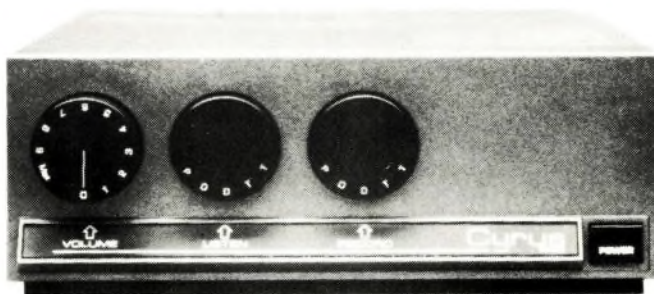
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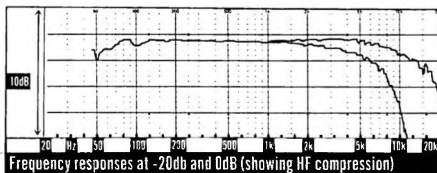
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SONY HF

This now very longstanding tape has been progressively improved over the years, and now sets quite a high standard for a budget ferric. The only lab indicator to its modest price was in the pink noise test, which showed a little operating dynamic range loss with music type signals, the losses increasing at higher frequencies. The static signal/noise and overload/saturation figures were unexceptional but generally satisfactory, but the sinewave response was extremely flat. Dolby compatibility is only adequate, however, since the sensitivity is a little low.

Sound quality is more than acceptable for a cheap tape, but was nevertheless unexpectedly 'coloured'. The tape has a close, 'dry' balance, with some smearing of midrange information and a rather 'thumpy' bass. The treble on the other hand seemed clean and precise, which probably reflects the healthy noise modulation. This is a good, cheap tape, blessed with good mechanics and smooth tape running, but sonically a little crude.

Sensitivity: -0.5dB. **Signal/noise:** -46dB for 0.8% THD. **10kHz compression:** 4.0dB.



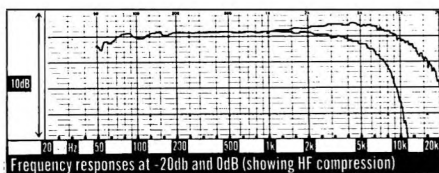
SONY HF-S

Sony's two premium ferrics are in extremely attractive housings with wide, unobstructed windows, and well specified mechanics, though *HF-S* falls short of the standard of the prestige *HF-ES* here (see separate review).

HF-S is based on *HF*'s gamma ferric magnetic particles, with careful binder distribution (Sony's description) to reduce noise and boost output. This appears to have worked: *HF-S* does indeed give respectably above the normal IEC level output level, not to mention a mildly rising output in the high frequency area. With good noise, overload and noise modulation figures, the tape emerges from the lab with flying colours.

It also sounds excellent. This is clearly a true high fidelity tape which is qualitatively broadly comparable to quite a number of Type II tapes. Characteristically, *HF-S* sounds clear and bright with excellent resolution and stereo soundstaging. It has a tonal explicitness denied most ferrics, but a just detectable 'fuzziness' at the top end. The response shape is just oddball enough to be a possible problem from the Dolby compatibility viewpoint.

Sensitivity: +0.4dB. **Signal/noise:** -48dB for 0.8% THD. **10kHz compression:** 4.8dB.



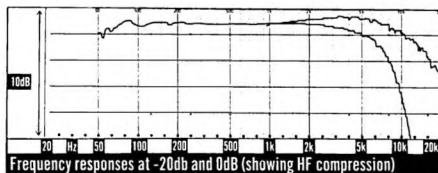
SONY HF-ES

To a first approximation, *HF-ES* is similar to *HF-S*, but with a better magnetic particle described as a 'single crystal gamma' and high precision ceramic guides in the mechanics. The most notable difference is that output is increased, by around a dB at all frequencies compared to the standard IEC level. *HF-ES* is also a touch bright, and in combination with the high output makes a tape best suited for decks with adjustable record bias (or an automatic tape alignment procedure). *HF-ES* really does have very dubious compatibility.

Working dynamic range is very wide, ensured by low noise combined with excellent overload characteristics. Noise modulation is also low, a benefit of good tape finish.

HF-ES has a near-crystalline purity and high frequency resolution to rival the best metals. But it is also terminally incompatible, and only really avoids Dolby mistracking on a deck with tape alignment. Even Sony's cassette decks as supplied don't (usually) suit this tape particularly well.

Sensitivity: +0.8dB. **Signal/noise:** -48.5dB for 0.8% THD. **10kHz compression:** 4.4dB.



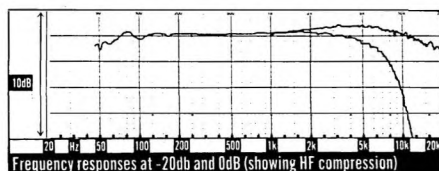
TDK AD

TDK *AD* is probably the most popular premium ferric on the market, and a fine performer by any standard, partly because it has been continuously refined in the years it has been on sale. The housing, also subject to detail refinement over time, looks boringly conventional, but actually offers very good reliability and excellent wind performance (a low incidence of tape scatter).

Sensitivity is nominally at or about IEC level, whilst hiss is an extraordinarily low, state of the art-busting-54dB. This isn't achieved at any significant cost to overload or distortion, both of which are fine. *AD* is essentially IEC compatible - a bare trace of brightness may be noticeable when used with accurately adjusted decks. But on the whole this tape has a neutral tonal balance, which combined with its normal sensitivity means that Dolby tracking integrity is likely to be good.

Sound quality was predictably excellent all round. The tape has ample clarity and dynamic range, so subtle information is preserved. The top is not hemmed in, neither are dynamics squashed. Highly recommended, obviously.

Sensitivity: +0.2dB. **Signal/noise:** -54dB for 0.8% THD. **10kHz compression:** 4.4dB.

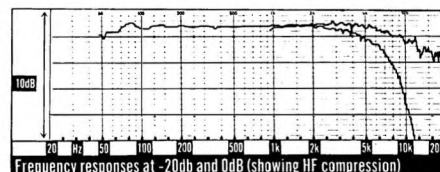


TDK AD-X

This is the super version of TDK *AD*, and an extraordinary performer which is intrinsically as good as almost any Type II or IV tape. Output is joint highest of all ferric Type Is at +0.8dB. (Sony *HF-ES* is the other very high output ferric, but *AD-X* has a flatter frequency response and is therefore rather more compatible than the Sony.) The TDK tape is also considerably quieter. *AD-X* falls only 1dB short of the exceptional *AD* noise figure, but more than makes up for this with a much increased headroom, especially at high frequencies. *AD-X* in practice offers a wider dynamic range than any ferric tape known to the author (or his analyst), a finding that was confirmed with the spectrum analysis tests.

High output does mean potential Dolby mistracking - encountered with the test deck when adjusted for an IEC standard tape. The solution is obvious - to record without Dolby which the wide dynamic range of this tape (and *AD*) positively encourages. Both tapes have excellent inherent sound quality with masses of detail, along with a firm bass and real transparency. Hardly like tape at all...

Sensitivity: +0.8dB. **Signal/noise:** -53dB for 1.0% THD. **10kHz compression:** 4.5dB.

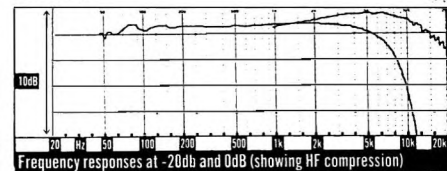


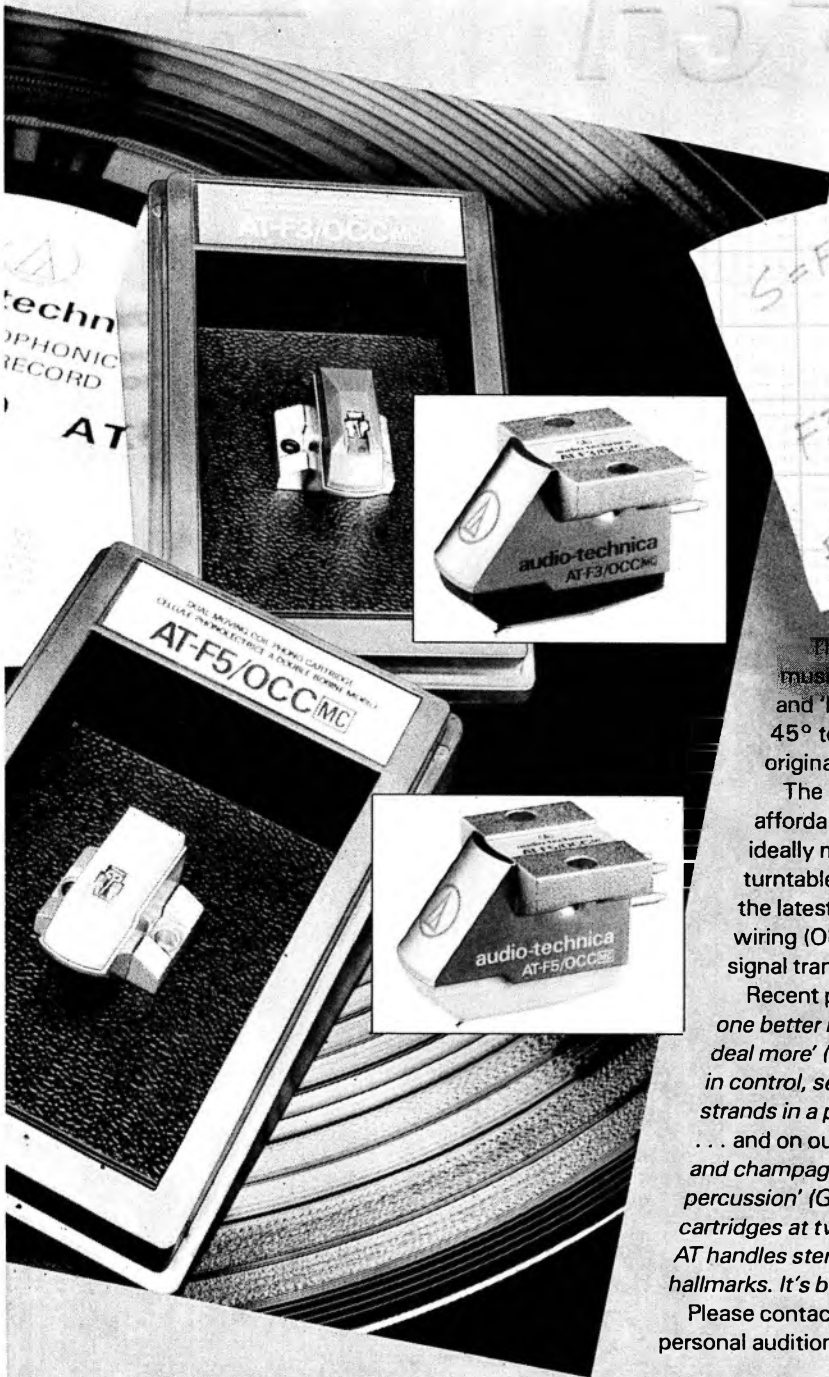
THAT'S FX

As well as pioneering the use of metal coatings for use in the Type II (chrome) bias slot, That's (Taiyo Yuden) now bid to add to their eccentric reputation by using cobalt doping with this Type I tape (a technique previously associated exclusively with Type II formulations).

The results are unevenly impressive. Treble output especially is very strong, though noise levels are only moderately good. Output is very high, and although this can be a very good thing, it does mean that Dolby record/replay tracking is compromised.

FX sounds very clear and precise. Low noise modulation kept the treble clean, but tonally things were slightly out of kilter, and it was a little thin and disembodied in the midband. The tape introduced a 'hole' in the middle of the frequency range, which although exciting in a rather assertive hi-fi way is not exactly accurate. Lack of compatibility is a liability that only a cassette deck with tape tuning can cure. But when properly aligned, *FX* can offer impressive master-tape-like qualities of firmness and stability.





There's now a further refinement to our successful musical formula where 'E' is pure musical enjoyment and 'MC' are our unique dual moving microcoils, set at 45° to the left and right in the same configuration as the original record cutter head.

The AT-F3 and AT-F5 are rapidly setting new standards in affordable analog listening with a specification that's ideally matched to the demands of modern audiophile turntables and tonearms. In addition, both models feature the latest advance in electrical systems . . . OCC internal wiring (Ohno Continuous Casting) which greatly enhances signal transfer.

Recent press comments on the F3 have included . . . 'to go one better in all respects you would be looking to spend a great deal more' (HI-FI ANSWERS) . . . 'the AT-F3 remained perfectly in control, separating and presenting the music's individual strands in a persuasive and believable way' (NEW HI-FI SOUND) . . . and on our F5 . . . 'there was a transparency of texture and champagne like quality on transients, strings, brass and percussion' (GRAMOPHONE) . . . 'digs out detail better than many cartridges at twice the price' (HI-FI REVIEW) . . . 'the way the AT handles stereo is sure to become one of it's recognised hallmarks. It's brilliant.' (HI-FI ANSWERS).

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Technica House, Lockwood Close, LEEDS LS11 5UU. Tel: 0532 771441

	AT-F3 MC OCC	AT-F5 MC OCC
Frequency response:	15-50,000Hz	15-50,000Hz
Output voltage: (1kHz, 5cm/sec)	0.35mV	0.30mV
Channel separation (1kHz):	27dB	27dB
Channel balance:	1.5dB	1.5dB
Recommended tracking:	1.5g	1.4g
Load resistance:	20ohms	20ohms
Load capacitance:	200-300pF	200-300pF
Compliance: Mod:	35mm/N	35mm/N
Stylus geometry:	0.10 x 0.20 mm square-shank elliptical	0.07 x 0.14 mm Nude square Bi-radial
Vertical tracking angle:	23°	23°
Weight:	5.0g	5.0g



 25 years in Hi-Fi.

TYPE I FERRICS

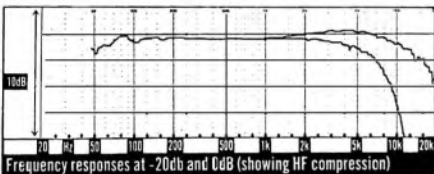
THAT'S TX

TX is less idiosyncratic than most Taiyo Yuden tapes. Output is a little below normal, though not enough to materially affect Dolby tracking if the listening findings were representative. The response shape is very nearly ideally flat, mod noise is decently low, and the same applies to bias noise (hiss) when judging by anything other than TDK AD/AD-X standards.

Sound quality lived up to this promise, with a useful combination of precision and neutrality, a well integrated bass/midrange, and a slightly 'sharp' sounding treble.

That's *TX* is much more conventional than *FX*, and trades a little of the latter's specialness for greater compatibility. In an ideal situation, using a tape deck with adjustable bias, equalisation and sensitivity, *FX* is potentially the more capable, better sounding tape. But in the 90% of cases where the tape is used in a machine with fixed, roughly IEC standard settings, *TX* is likely to prove a better candidate. And its intrinsic quality is very good.

Sensitivity: -0.3dB. **Signal/noise:** -46dB for 0.8% THD. **10kHz compression:** 4.8dB.



TAPE MANUFACTURERS

AGFA-GAVAERT LTD., 27 Great West Road, Brentford, Midd. TW8 9AX. Tel: 01-560 2131.

BOOTS THE CHEMISTS LTD., 3rd Floor, 8 Regent Street, Bucks. NG1 5BQ. Tel: (0602) 410969.

DENON, Hayden Laboratories Ltd., Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks. Tel: (0753) 888447.

FUJI PHOTO FILM (UK), 125 Finchley Road, London NW3 6JH. Tel: 01-586 5900.

GOLDSTAR UK SALES LTD., 264 Bath Road, Slough, Berks. Tel: (0753) 691888.

JVC (UK) LTD., Eldonwall Trading Estate, 12 Priestley Way, Staples Corner, London NW2. Tel: 01-450 3282.

MAXELL UK LTD., 3a High Street, Rickmansworth, Herts. Tel: (0923) 777171.

MEMOREX, Memtec Products, 2 Ascot Road, Bedford, Feltham, Midd. TW14 8QH. Tel: (0784) 247241.

REALISTIC, Tandy UK, Tandy Centre, Leamore Lane, Bloxwich, Walsall, W. Midlands WS2 7PS. Tel: (0922) 710000.

SCOTCH, 3M United Kingdom PLC, PO Box 1, Bracknell, Berks RG12 1JU. Tel: (0344) 426726.

SONY UK LTD., Sony House, South Street, Staines, Midd. TW18 4PF. Tel: (0784) 67000.

TDK UK LTD., Pembroke House, Wellesley Road, Croydon, Surrey CR0 9XW. Tel: 01-680 0023.

THAT'S, Portfolio Marketing, River Walk, Tonbridge, Kent TN9 1DT. Tel: (0732) 365071.

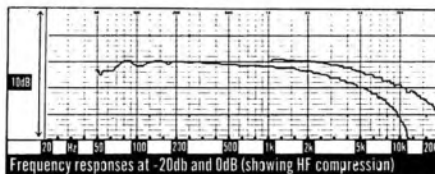
TYPE II CHROMES

AGFA CDXII

Pure chromium dioxide *CDXII* is very insensitive, being a full 2dB below the line at 400Hz, and rather more than that for most of the remainder of the audio frequency band – it rolls off quite severely in the treble. Made to look unnaturally good by virtue of the treble loss, noise levels are nevertheless low, and in practice may be limited by machine hiss. Modulation noise is also very low, a common feature of chrome rather than pseudo-chrome tapes generally. But headroom is limited and the effective dynamic range of this tape is a little low.

CDXII sounded almost terminally relaxed, lacking real energy or drive. But low level clarity was actually very good, and stereo soundstaging unusually consistent and believable. Compatibility is obviously not a strong point (unless you happen to have one of the remaining decks which has been set up in accordance with the old DIN chrome standards); this rather than any inherent lack of prowess is likely to prove the limiting factor of this otherwise highly capable and sweet sounding tape. If you have a deck with fully adjustable everything, give it a try.

Sensitivity: -2.1dB. **Signal/noise:** -54dB for 1.0% THD. **10kHz compression:** 2.4dB.

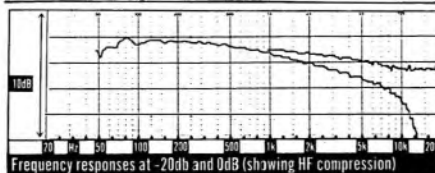


AGFA CDXIS

Agfa evidently realise that *CDXII* is not going to win many friends amongst Japanese cassette deck owners, so they provide an alternative in the form of *CDXIS*. This dual layer tape has much greater HF energy and better LF sensitivity too – but much worse modulation noise, as anticipated. Even this tape, however, has below average sensitivity, and the frequency balance still sharply favours the bass. The downwards tilt at HF is very marked in energy terms, and is responsible for the predominantly slow, dull sound the tape possesses.

CDXIS in fact sounded a little less dull and constrained than pure chrome *CDXII*, but it did have somewhat impaired very low signal performance. Overall it seemed a little crude and caricatured. It's not a bad tape on balance, but not inherently as good as *CDXII* musically. In any case it's up against particularly stiff opposition, and is best suited to recorders with full tape adjustment facilities, since compatibility is distinctly poor.

Sensitivity: -0.6dB. **Signal/noise:** -54dB for 0.9% THD. **10kHz compression:** 2.2dB.



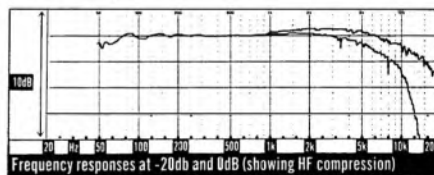
FUJI FR-II

As usual with non-European brands – and increasingly even with European ones – Fuji's Type II formulations are based on a high energy ferric oxide, doped with cobalt to raise the coercivity level the required amount. *FRII* is a sensibly compatible tape and should give excellent results on a wide range of tape decks, largely because sensitivity is standard and the frequency response shape essentially flat.

The other test results also gave numbers which rank as about average. Noise, for example, is a respectable dB or so below the best, whilst headroom is excellent at 400Hz, deteriorating to a straight good at higher frequencies. Modulation noise just ranks as fair.

This tape sounded consistently good, exactly as promised. If anything recordings sounded very slightly 'soft', but detail was good, and musical presentation using a good deck was unusually natural and unexaggerated. Noise was low enough to make sense of non-Dolby recording for less dynamically demanding material where the record levels can be kept suitably high.

Sensitivity: 0dB. **Signal/noise:** -52dB for 0.6% THD. **10kHz compression:** 2.0dB.

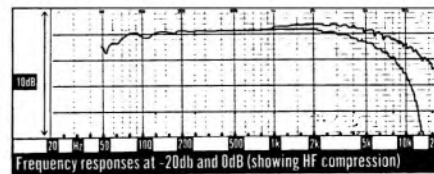


FUJI FR-IIS

FR-IIS is a slightly improved version of *FR-II*, and on paper is supposed to run smoother and therefore give a better noise modulation figure. It didn't. The numbers were identical, and so too was bias noise (hiss). The *Super* version did offer a slightly higher output sensitivity (it isn't supposed to, but fortunately it isn't high enough to cause problems), and a little more headroom (also not on the menu). In essence though *FR-IIS*, like *FR-II*, is a very compatible Type II, with low noise, excellent headroom and a well tailored frequency response.

Paradoxically (given the numbers), *FR-IIS* did manage to sound a little more alive and tauter than its cheaper brother, but both are excellent tapes which sound very accurate, and which offer surprisingly little dynamic squash and first class stereo. The neutrality and smoothness of *FR-II* was found here too, while noise can be more effectively suppressed with wide-ranging material using *FR-IIS*. This tape may be worth the expense where that little extra is required, though for most day to day use it's probably hard to justify the higher cost.

Sensitivity: +0.3dB. **Signal/noise:** -52dB for 0.6% THD. **10kHz compression:** 2.1dB.

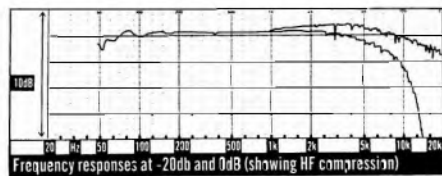


JVC UFII

This pseudochrome tape is typical of modern Type IIs in many ways. It has slightly above the line output across the audio frequency band, a mild excess of energy at high frequencies, well suppressed bias noise, and reasonable above the line headroom. When assessed using spectrum analysis and pink noise (simulating music), *UFII* proved to have a slightly greater dynamic range across the board than TDK *SA* (which is a convenient and useful yardstick by which Type IIs are often judged). The difference wasn't large, but being wideband the integrated effect is worth having.

However, modulation noise was several decibels worse than usual, and this correlated well with the distinctly roughened textures that were noted during the listening which is a pity, since in all other respects this is an excellent tape: the bass is lean and precise; the midband refined and detailed. The tape handled wide ranging dynamics as though born to the task.

Sensitivity: +0.3dB. **Signal/noise:** -53.5dB for 0.7% THD. **10kHz compression:** 2.3dB.

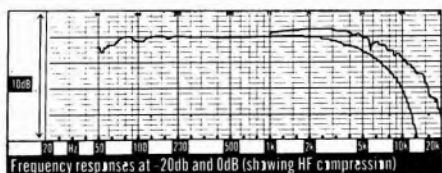


MAXELL UDII

Maxell's budget Type II high energy superferic is a natural foil to TDK *SF*, with which it competes closely in the marketplace. *UDII* has industry standard (*ie* IEC compatible) sensitivity and tonal balance, and will work happily with a wide range of cassette decks - any decent deck you can think of in fact. Its main limitation is a lack of real HF - note the faster than average fall at the very top end of the passband.

In practice this 'problem' was surprisingly innocuous. There was very little shortfall of resolution or 'top', though *UDII* did sound a little 'quieter' and smoother than *XLII*. The very good noise modulation - a tribute to Maxell's mechanical build and tape finish standards - is obviously part of the reason. *UDII* is also a little noisy by the best standards, and this did impart a slightly 'furry' coloration to the sound, especially when recording very quiet musical passages. The price excuses all, however, and *UDII* is excellent value for money.

Sensitivity: 0dB. **Signal/noise:** -51.5dB for 0.9% THD. **10kHz compression:** 2.2dB.



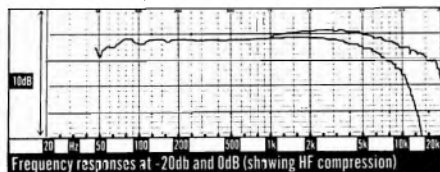
MAXELL XLII

Like TDK *SA*, Maxell's *XLII* mainstream Type II tape has been improved and refined over the years and generally kept in line with prevailing standards in the middle of the Type II market. It's very widely available and known to be a consistent product.

Built into Maxell's standard (good quality) shell, *XLII* is substantially IEC compatible. It's not an especially quiet tape, the measured -51.5dB being at a relatively high 0.9% THD and with limited headroom above that. Modulation noise is good, however - high quality mechanics and an excellent standard of tape finish ensure that.

Sensitivity is just below IEC, which dates the tape a little as does an overload performance at both 400Hz and 4kHz which lags today's market a little. The response shape is accurate, however, and compatibility is good, in practice as well as on paper. It's desirable to avoid too high record levels, and sound quality can be a little thin and bright, but on the whole performance is at least of average standard.

Sensitivity: -0.4dB. **Signal/noise:** -52.5dB for 0.8% THD. **10kHz compression:** 2.0dB.



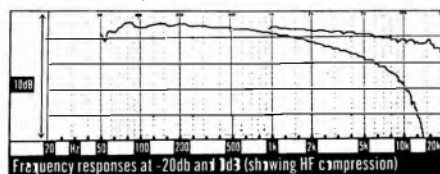
MAXELL XLII-S

This is Maxell's top Type II tape, and is equipped with their best cassette mechanism, based on a superbly finished shell with large observation window.

Earlier versions of *XLII-S* were tonally bright, but this has been corrected - over corrected if the review batch is anything to go by. Sensitivity is rather high at low and medium frequencies, falling only at HF as shown. Hiss is considerably less than with *XLII*, while headroom and modulation noise are broadly maintained. When everything is added together, and combined with the results of the spectrum analysis test, *XLII-S* emerges with a slightly better dynamic range, at HF especially. But it's also rather less compatible, and as a result really demands a deck with bias/EQ adjustments.

Corrected, it sounds a little sweeter and sharper, with less granularity and obviousness. If you prefer it in English, it's a more transparent sounding tape. It can also be driven consistently harder than *XLII*, and can quite successfully be used without Dolby processing, as long as the music doesn't have too many open gaps.

Sensitivity: +0.7dB. **Signal/noise:** -53.5dB for 0.9% THD. **10kHz compression:** 3.6dB.



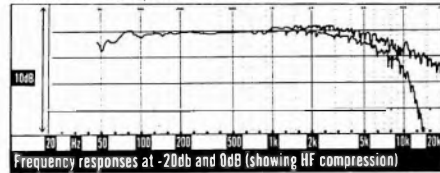
MEMOREX HBXII

HBXII is Memorex's middle Type II, at about £3 for 90 minutes making it a fairly ambitious product. The company are a bit vague about the constituents - maybe they've forgotten - but it seems to be a high energy, most likely a Japanese style cobalt doped ferric. It behaves like one, with a perfectly IEC compatible output level and an almost mathematically flat response curve.

However, the swept sinewave caught this tape out in an unexpected way - the very rough looking plot is indicative of uneven coating or dropout, and indeed was associated with exceptionally poor modulation noise. Although the sound wasn't rough in the way often associated with tapes that measure this way, there was some loss of fine detail and of selective ambient information, affecting LF reverberant cues least.

Noise and overload were acceptable, and the tape offered a wide ranging, uncompressed and basically clean account of itself, but with the subtle losses already described. Intriguingly good in parts, but flawed nonetheless.

Sensitivity: -0.1dB. **Signal/noise:** -52.5dB for 0.7% THD. **10kHz compression:** 1.8dB.



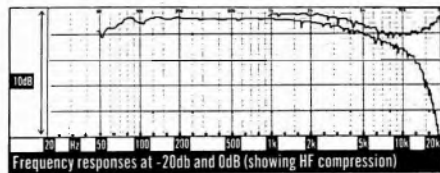
MEMOREX CDXII

The most ambitious of Memorex's multitude of Type II tapes, *CDXII* is a pure metal in true That's tradition, and expensive at just under £4 for a C90. Whatever next?

CLXII has better mid and HF dynamic range than TDK *SA* (the *de facto* industry standard), but a very high (albeit sub-That's) sensitivity, and a screwball HF response which will murder any noise reduction that relies on knowing where levels are going to be on replay. Note the tell-tale dropout 'spikes' which may be due to underbiasing (correct biasing would probably overexpose the tape's inherent HF 'Concorde nose'), and the Eiger-like headroom.

I wasn't particularly enamoured of the strident, messy (due to Dolby mistracking) and anomalous (transients seemed to be 'detached') sound of this very odd tape. The problem afflicts all Type II metals, which are after all a bastardised sub-species of the metal *genus*, and not to be taken seriously until cassette deck manufacturers start to take their compatibility seriously themselves - perhaps by introducing a Type V compromise setting.

Sensitivity: +1.2dB. **Signal/noise:** -50.5dB for 1.1% THD. **10kHz compression:** 1.2dB.



What the press say . . .

'New Hi-Fi Sound Magazine'

In an effort to encounter the predominant influence of Hi-Fi Markets, a group of independent dealers decided to form a limited company, AVID, in order to pool resources and compete for special offers and end-of-line dealers. Julian Richer, of Richer Sounds in London Bridge, was a member of AVID in the early days. He is now a very powerful independent and competes with AVID for deals.

Over the next few months, AVID will show that they have a unified aim by presenting a concerted advertising campaign aided by the in-house graphic department. Although there is some overlap between AVID, BADA and Hi-Fi Markets dealers, there's plenty of in-fighting.

Adding spice to the debate is the presence of Richer Sounds. Julian Richer has expanded the store phenomenally in its short life. It's now on target for a £2 to £3 million annual turnover. One thing you could never accuse Julian of is pretentiousness. The tiny shop is littered with boxes piled up to the ceiling.

What Richer Sounds specialises in are exceptionally low prices on end-of-line products. They also sell equipment that has been returned after appraisal to mail-order companies like Freemans. What happens is that the equipment is passed back to the manufacturers who store it in the warehouses once it has been checked by the service departments. Julian has really cornered the market in this kind of equipment.

Everything on sale at Richer Sounds is priced and clearly marked to indicate if it is end-of-line, mail-order return, or secondhand (Julian started business by advertising secondhand gear through Exchange & Mart). Two service

engineers are employed full-time to deal with customers' problems. And if customers can't wait for their equipment to be repaired, should something go wrong within the statutory one-year period, they should be able to bend Julian's arm into giving them a temporary replacement.

Aggressive marketing has helped Richer Sounds expand dramatically in a very short space of time. He has published a price list which shows every special price, except from those from specialist manufacturers who want to preserve their loyal, mainstream dealers. After all, it wouldn't do to have other dealers know how much of a discount someone like Julian Richer is getting.

The monthly price list carries cartoons of the staff and tongue-in-cheek biogs. Jez is the haggard wreck of a human being who would like to be an ageing rock star - he started by becoming a physical ruin, is waiting for a full laboratory.

As the staff are motivated (ie they get a slice of the cake), they tend to stay at the store, unlike some specialist stores where turnover is very quick. I heard a where turnover is very quick. I heard a story from one manufacturer who said that a leading chain-store requested training for their staff three months after the company had conducted a course. On mentioning this fact, it transpired that all the staff had left within price list, Richer Sounds published a coupon offering to refund travel expenses as long as the buyer spent a certain amount of money and could show that he had taken the cheapest route to the shop. (I'm told that someone came all the way from Birmingham and tried to claim. Does anyone know the outcome?)

With patchy trading in so many stores, it's good to see someone putting the fun back into buying hi-fi. There's a lot of hypocrisy in every industry. Hi-fi has its share, and it's particularly well illustrated

by the attitude towards Richer Sounds and AVID.

Both operations provide a valuable service to the industry. Imagine you are a big hi-fi manufacturer trying to flog a quartz-locked direct-drive turntable for £130. You're stuck with 2,500 boxes in the warehouse with next season's shipment on its way from Japan. You're regular, franchised dealers don't want the old models. What happens? Julian Richer buys the lot at a knock-down price and sells them with an adequate margin at a retail price of less than £50. I challenge anyone to say that that was not a good buy at the price.

One thing you could never accuse Julian Richer of is pretentiousness

As things stand, AVID are inviting trouble by selling quality hi-fi at knock-down prices. The tenuous basis on which the industry has operated over the last few years has been that high-quality equipment has a high dealer mark-up in order to encourage him to give the time and effort required for demonstrating and setting up. By buying special-offer deals on systems comprised of products that have been consistently recommended by the magazines, you could run the risk of not receiving that necessary service.

With Richer Sounds, you know you won't receive this type of service. So you shouldn't mind when you don't get it. The specialist dealers will say that whatever you buy will need proper setting up and installation. If you believe this - as we do - then you've no alternative but to shop at an upmarket specialist. But don't expect the huge price reductions, end-of-line deals, or mail-order return deals that the likes of Richer Sounds can supply.

The place was crammed. It was rush-hour. We had to sidle in, feet shuffling, breath held in, head back to avoid butting the taller assistants on the chin, bottom forward in case we activated a quartz synthesiser tuner or nudged a semi-automatic, belt-drive turntable. In other words, there was someone else in the shop.

Richer Sounds claims to have won the coveted award of 'Untidied Hi-Fi Shop of the Year, 1982/3' and looks like walking away with the prize for the foreseeable future.

'There's the up-market type of shop,' states the brochure, 'where you'll get personal service, a smart environment, demonstrations, installation and so on.' Richer Sounds is not one of these. For example, 'The nearest you get to installation is to make sure you get an instruction book.' (The trick, incidentally, is to take it outside, where there is room to open it.) Its address is not even in the A-Z, which does have the result of keeping people away, thus providing what passes for elbow room

on its premises.

One of the reasons for the premises being crammed with up to single figures, is that the **Punch Consumer Bureau's Technical Adviser** spends his spare time browsing among the silicon chips. Since he is 152, he is youthful enough to keep up with prices in the audio field; he assures us that the Richer Sounds compact disc player is £150 cheaper than the cheapest normal retail price and he also assures us that he still can't afford it. What he can afford is much of the rest of the stock, which is highly economical - just above back-of-a-lorry sum - because it is last year's model, or mail order returns, or bankrupt stock, or simply part of a very bulky bulk purchase. El Cheapo here does not mean a stony silence after a couple of months' use.

'If you only listen to Radio Moscow,' they advise, 'there's no point in buying a hi-fi tuner, just a simple shortwave radio.'

'Punch Magazine'

Julian Richer's jam-packed and unpretentious little shop exploits the Japanese electronics industry's planned obsolescence strategy to more or less everyone's benefit. Ranges change every 12 months, but it's generally more of a styling face-lift than a radical change in technology. So you can buy last year's - or the year before's - model without it being much different in performance terms.

Richer Sounds have been tremendously successful in snapping up these end-of-line stocks and selling them off at really low prices. (They also handle mail-order catalogue approval returns; these are checked and guaranteed, though you might ask yourself why they were returned.) Richer are friendly and helpful but don't do demos, and slyly suggest you get these elsewhere first. But they have their own repairs department (and electronics whizz kids might take advantage of the cheap as-found faulty gear they sell).

If after looking around you decide the audiophile approach is not for you, Richer's no nonsense pile-it-high sell-it-cheap approach is hard to beat. Their price list and guide are free.

'City Limits Magazine'



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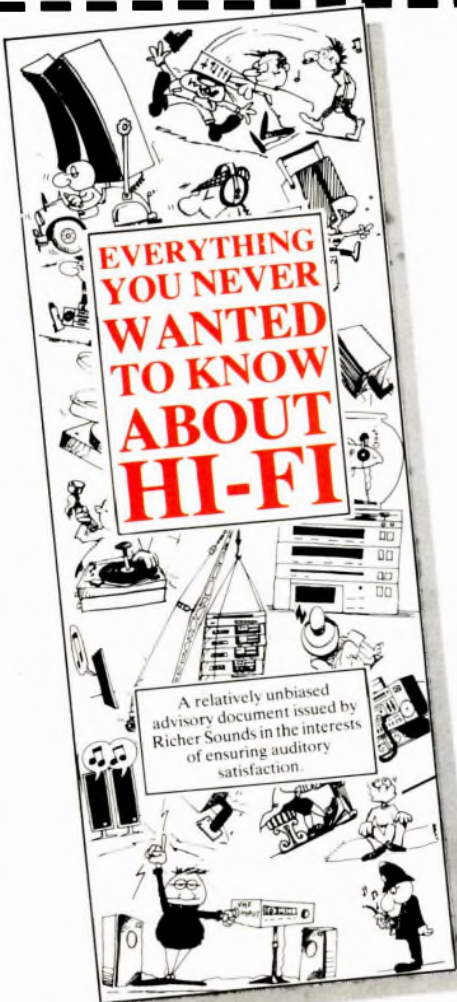
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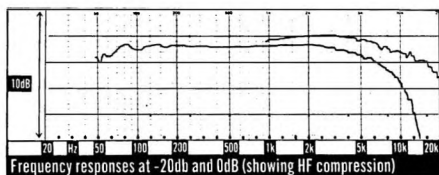
MEMOREX CRXII

Memorex's 'scattergun' approach to Type II tape design sees them using almost anything magnetic to coat their tapes, as long as it's different from the time before. *CRXII* is a genuine chrome tape, and is also the budget model, with a TSP just the right side of the psychologically important £2 barrier.

Sensitivity is just 0.8dB short of IEC normal, which is good for a chrome. Headroom is also good by chrome standards, but a little limited by absolute standards. Modulation noise is exceptionally low (a worthwhile chrome characteristic), but HF compression is a little higher than usual. However, it appears that this in fact compresses fairly evenly at all frequencies, not merely high ones, and this characteristic is therefore readily ignored. The frequency response shape is remarkably accurate.

How does it sound? Excellent. As long as record levels are kept a little lower than normal, the tape sounds exceptionally smooth, sweet and refined. Very slightly too laid back, there are subtle losses of detail, but *CRXII* makes thoroughly musical noises.

Sensitivity: -0.8dB. **Signal/noise:** -51dB for 1.0% THD. **10kHz compression:** 2.4dB.



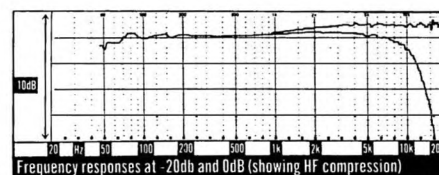
SONY UX-ES

Number two in the Sony Type II hierarchy, *UX-ES* uses the same tape stock as in *UX-Pro*; differences between them are limited to the design of the housings. Both employ the same unusually attractive, large window cassette shell design (as do other Sony tapes), but *UX-ES* eschews the ceramic tape guides and certain other luxury features fitted exclusively to the more expensive 'Pro' mechanism.

The tape is sensitive and has an abundance of HF, leading to a topky balance with a response that barely tails off at 20kHz (-20dB). Compression is also low, which is even more relevant to normal use. Noise is quite low, and so is distortion - this tape has almost unprecedented headroom.

Compatibility isn't too good. But a 'tweakable' deck with good headroom of its own will make superb recordings which are almost as clean, precise and concise as the state of the art allows. There's little of the usual cassette style 'waffling' here. But with many decks the tape is going to sound sharp to the point of edginess.

Sensitivity: +0.2dB. **Signal/noise:** -52dB for 0.6% THD. **10kHz compression:** 1.8dB.

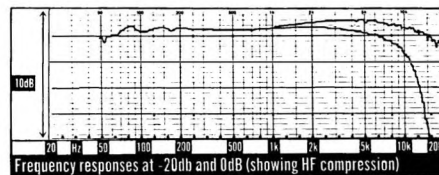


SONY UX-PRO

If you like *UX-ES* so much you'd like to pay a bit more for it (and who would blame you?) *UX-Pro* is the tape to go for. Using very similar tape stock, *UX-Pro* sports refinements like extra shell reinforcement, a superior spring pressure pad design and ceramic tape guides. The net effect should be to reduce mod noise, but this parameter can be at the mercy of other factors (even random ones), and perversely *UX-ES* gave slightly better mod noise numbers on test. Perhaps additional drag results in slight roughness whilst running?

Performance is otherwise similar to *UX-ES*, but with slightly greater sensitivity (+0.4dB ref IEC) and a rather better controlled (and therefore more compatible) top end. Again, adjustable bias and EQ are required for best results, but the tape's phenomenal dynamic range helps facilitate Dolby-less recording. With or without Dolby, the tape is one of the most able on the market, capable of tight, tidy and dynamic recordings - qualities which ultimately help ensure unusually explicit stereo soundstaging.

Sensitivity: +0.4dB. **Signal/noise:** -52.0dB for 0.5% THD. **10kHz compression:** 2.0dB.

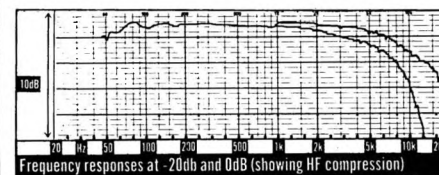


SONY UX-S

UX-S has little to do with the more expensive *UX-ES* and *UX-Pro*, which form a natural pair. This one is more sensitive than either, but has a sharply falling HF trend which was already noticeable in the response plots at 2kHz. To cap it, headroom is not outstanding and noise levels are quite high, which means that recording levels need to be wound well up if possible.

UX-S sounds nothing like the other Sony chromes (a super ferrics). It has little of their outstanding energy and precision, and sounds altogether a little vague and lacklustre. Much of this can be laid at the door of the sharply falling treble response of course, but high sensitivity doesn't help, since Dolby mis-tracking and the aural inconsistencies it caused were abundantly obvious. Taking everything together, I can't see a lot of justification for this tape, unless there are people out there who like a 'nice', slightly fat and dampened sound.

Sensitivity: +1.0dB. **Signal/noise:** -50.5dB for 0.7% THD. **10kHz compression:** 2.4dB.

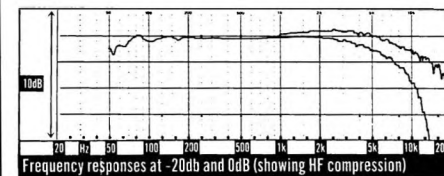


TDK SF

Supplied in a natty blue cassette shell, *SF* is electrically very similar to the best known TDK Type II, *SA*, but is reformulated to sell at a lower price, with some impairment of performance all round.

The response plots for *SF* and *SA* are almost interchangeable. *SF* has fractionally lower sensitivity than *SA*, but an almost ideally flat response shape and first rate IEC compatibility. *SF* is also slightly noisier than the market leader, with a little more 0VU distortion and lower headroom to match. Modulation noise was also a little higher, accounting for some audible coarseness when compared directly to *SA*. *SF* also tends to sound a little lightweight in this comparison, but this is a budget tape, and in relation to price it works extremely well.

SF was capable of clean and well balanced recordings with just a trace of softness at the two frequency extremes. On balance, however, it isn't objectively much worse than *SA*, and remains excellent value for money. **Sensitivity:** -0.2dB. **Signal/noise:** -53.0dB for 0.8% THD. **10kHz compression:** 2.4dB.



TDK SA

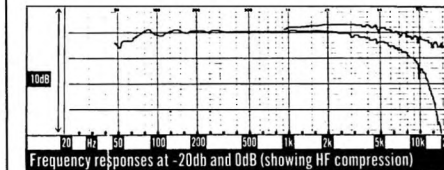
TDK's high energy cobalt-doped ferric *SA* is the single best selling Type II this side of Barnard's Star - it boasts a very large percentage share of the UK Type II market. It is also a highly compatible allrounder of considerable merit.

Fitted in a high quality Braille marked housing (like all but the cheapest TDKs), *SA* is engineered to conform to IEC. It has strictly normal output, a neutral frequency response and extremely well suppressed background noise. Headroom is only moderate, which pulls the overall dynamic range down a little.

The point about *SA* is that whilst it fails to excel in any particular area, there are no important weaknesses - the tape has an excellent balance of properties. And it is ideally compatible with any deck set up to the normal IEC standard.

SA has been a consistently excellent performer for a long time, and is still amongst the most neutral and even tempered tapes with good detail, dynamics, noise and 'listenability'. If anything the tonal balance tends towards warmth, with some loss of precision noticeable in high resolution systems.

Sensitivity: 0dB. **Signal/noise:** -53.5dB for 0.7% THD. **10kHz compression:** 2.1dB.



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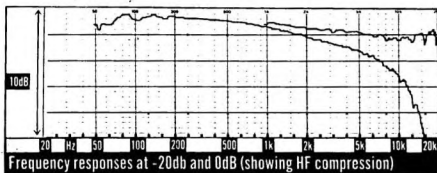


TDK SA-X

Here's an oddity: although based on doped ferric stock, and therefore a classic Type II formulation, *SA-X* has a response shape reminiscent of a pure chrome. However, anyone trying to substitute *SA-X* for a chrome will get a surprise. Although superficially similar in tonal balance, favouring the bass and lower mid with treble detail muted, *SA-X* will sound a great deal louder. There's also the issue of Dolby compatibility which will be a problem for either type if the recorder is aligned for the other. In fact, *SA-X* is always likely to cause mistracking unless there's some means of adjusting all the parameters that affect tape matching – bias, EQ and sensitivity.

SA-X also has a slight but noticeable 'sting in the tail' – an upturned response at extreme HF that can give the tape a slightly grainy sound. But noise levels are exceptionally low – easily the best in the entire group in fact – and there's useful headroom too. Dynamic range far exceeds any chrome, and beats *SA* hollow above about 3-4kHz. Definitely an oddity, but one with a lot of potential in the right player. However, I fear I just didn't find that player...

Sensitivity: +1.1dB. **Signal/noise:** -55.0dB for 0.7% THD. **10kHz compression:** 3.8dB.

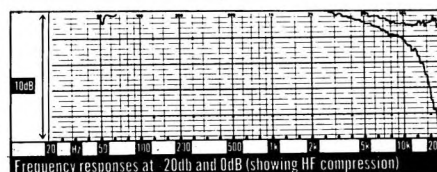


THAT'S EX

Idiosyncratically yours from Taiyo Yuden. The tape with the world's strangest moniker is also the world's most oddball electromagnetically. Designed with the Type II chrome slot (vaguely) in mind, *EX* (and *EM-X* for that matter) is in fact a metal like any proper Type IV metal. Even odder, very little has been done to disguise the fact, for example by making it truly compatible with the Type II bias setting. Instead, the tape is so sensitive you can practically hear what's been recorded even *without* a cassette deck! However, working dynamic range is enormous, and headroom is simply cavernous at bass and treble extremes alike.

The response has a saucer like shape with a dip centred on 10kHz leading to a smooth and weighty but rather dull sound. And without sensitivity adjustment on the cassette deck, Dolby mistracking is assured. Dropout was noticeable on headphones with this tape, which is often a sign of underbiasing. Not recommended.

Sensitivity: +2.4dB. **Signal/noise:** -49.5dB for 1.0% THD. **10kHz compression:** 1.3dB.

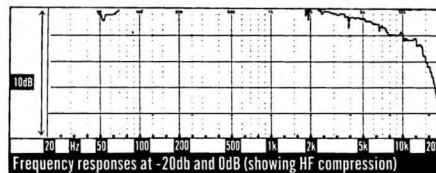


THAT'S EM-X

Another Type II metal, *EM-X* is essentially an improved and refined *EX*. Compared to the latter, *EM-X* is a little quieter, and has an even wider dynamic range on complex music type signals. Again, sensitivity is outrageously high – *EM-X* drove the sinewave measuring equipment way off scale, with sensitivity more than 2dB above normal. A tape with wide ranging sensitivity adjustment will be able to make much of this extraordinary open, clean tape; otherwise forget it.

There were other problems too. The mechanics of some of the samples were a bit suspect, and some dropout was audible (though not to the degree found with *EX*). The tape sounds highly distinctive on audition, with surprisingly good clarity (like most Type IV metals) and an odd but decidedly three dimensional stereo soundstage. But tonal colours were often distorted or compressed, and Dolby mistracking will be a problem in the absence of suitable adjustment on the cassette deck. Furthermore, background noise may be a little high for non-Dolby recordings, even with the massive available headroom – but it may be worth a try.

Sensitivity: +2.3dB. **Signal/noise:** -50.0dB for 1.0% THD. **10kHz compression:** 2.3dB.

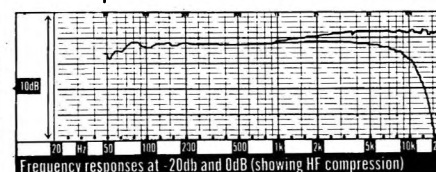


THAT'S VX

This new tape came without much explanation, but appears to be That's' stab at a non-idiosyncratic Type II, presumably based on a doped ferric pseudochrome formulation like most others. Sensitivity is actually just below IEC norm, and the response shape could have been drawn using a TDK, Maxell or Fuji tape. Signal/noise is very good – much better than the Type II metals – and distortion is lower too. Headroom is only modest, but modulation noise is very low. In the spectrum analysis test, *VX* came out ahead of stalwarts like TDK *SA* for working dynamic range – a not unimpressive result.

VX did quite a good job imitating the source, ending up sounding rather like JVC *UFII*. Clean, detailed and dynamic, it is also a little roughened around the edges. I was also disturbed to note significant if intermittent dropout with this tape, which calls into question coating uniformity. I'd want further reassurance on both this factor and also the housing quality before getting wildly enthusiastic.

Sensitivity: -0.5dB. **Signal/noise:** 53dB for 0.7% THD. **10kHz compression:** 2.0dB.



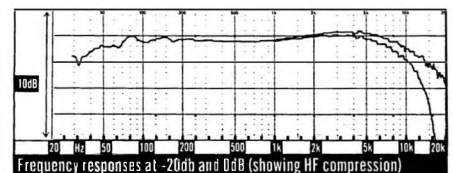
FUJI FR METAL

Coated with a proprietary metal powder using a proprietary binder and coating technology, the ordinary looking Fuji cassette shell has one useful hidden extra – head cleaning leader tape.

FR Metal has a just detectably falling top end response, a slightly lower than normal sensitivity, and a noise/distortion compromise below the industry norm. These shortcomings were all small, however, and good compatibility suggests Dolby mistracking shouldn't be a problem. In fact this is one of the very few metal tapes that is neutral; most of its peers being variously bright, both on the test bench and in practice. However, spectrum analysis did show that *FR Metal* has a rather restricted operating envelope.

In fact the sound turned out to be a little better than expected on audition, due to a slightly clearer, more colourful and less 'metallic' (no pun intended) mid-top than usual. However, the higher noise floor is audible, and the tape needs to be driven hard for this reason. The tape itself has good headroom, but remember that many cassette decks don't.

Sensitivity: -0.4dB. **Signal/noise:** 49.5dB for 0.6% THD. **10kHz compression:** 0.9dB.



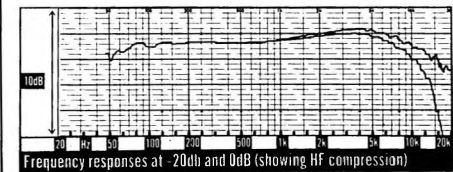
MAXELL MX

Although sensitivity is a little lower than normal, Maxell's *MX* has no shortage of HF energy, the result being a slightly bright HF balance and negligible Dolby mistracking (Dolby starts acting around 1kHz, where the response curve has all but peaked).

That aside, *MX* is a middle of the road metal tape electrically. Saturation performance is very slightly below group norm, but bias noise is acceptably low, and HF compression is well contained. Output uniformity of the tested samples was good, and older *MX* tapes have kept their condition well, which hasn't always been the case with metal formulations. Noise modulation is also good, which speaks well of the surface finish.

Sound quality is very good, and on the right machine (actually any decently engineered metal-capable deck) Maxell *MX* sounds smooth, fairly neutral and has excellent detail and dynamics. Noise is quite well suppressed, but the tape can't be pushed quite as hard as some, so recording levels need to be watched.

Sensitivity: -0.7dB. **Signal/noise:** 51dB for 0.5% THD. **10kHz compression:** 1.0dB.



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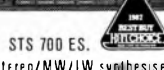
APM 66 ES.

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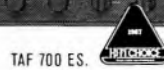
STS 700 ES.

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TAF 700 ES.

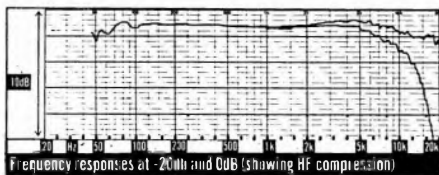
110W stereo integrated amplifier with Gibraltar Chassis.
Hi-Fi Choice: 'Worth Considering'

SONY METAL-ES

Sony *Metal-ES* has a very flat response shape indeed when tested with a sinewave signal (see plot), but pink noise spectrum analysis tells the slightly different story of a rising energy trend with increasing frequency. Sensitivity is high, which is likely to cause Dolby mistracking, but modulation noise is extremely low, and spectrum analysis also suggests a usefully wider working dynamic range than the IEC reference, especially at HF. On the other hand, the Sony does have more HF compression than normal, which may well have arisen because the sensitivity combined with the intrinsic high energy of the tape is pushing the recorder close to its limits.

The reality is that *Metal-ES* is an intrinsically superb tape, spoiled in practice by lack of compatibility. There was a loss of body and 'weight' in the crucial midband region, taking away some of the stature of the music, though the quality of bass and treble alike was very clean and the tape is very quiet. Strictly for decks with tweakable bias and equalisation.

Sensitivity: +0.8dB. **Signal/noise:** 52.5dB for 0.4% THD. **10kHz compression:** 1.4dB.



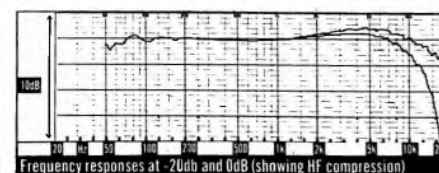
TDK MA-X & MA-XG

For all intents and purposes, this tape can be treated as IEC compatible, so that a correctly set up cassette deck should suit well. In fact *MA-X* has modest HF lift, amounting to about 1dB/5kHz measured at -20dB, but less than half that at 0dB. *MA-XG* is very similar tape-wise, but features a costly zinc diecast housing beloved of photographers. Measurement suggests its benefits are nebulous, with slightly poorer mod. noise and wind scatter.

Most of the figures rate a straight average, suggesting that this is a good, but no longer exceptional tape. Signal/noise is -51dB (the range of metals extending from -48.5 to -52.5dB), noise modulation is excellent, and compression (measured at 10kHz) is low.

For some time these have been amongst the most predictably excellent sounding metal tapes around. There's some loss of resolution when the sound gets very busy, and a touch of HF glare with some material. A deck with adjustable metal equalisation could be an advantage but in most circumstances they perform consistently well, with a smooth, integrated overall quality.

MA-X: Sensitivity: 0.dB. **Signal/noise:** 51.5dB for 0.5% THD. **MA-XG: Sensitivity:** -0.2dB. **Signal/noise:** 51.5dB for 0.5% THD. **10kHz compression:** 1.1dB.



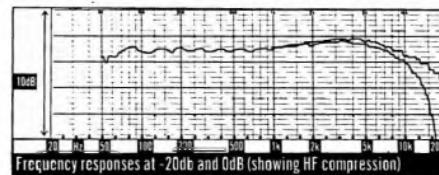
THAT'S MG-X

On the whole, That's' metal tapes are nothing like so idiosyncratic as their Type II metals, yet complete normality somehow evades this one at least. Even the housing is unusual, the wedge shape observation window being pretty but not altogether practical.

That's *MG-X* has constrained dynamic range by metal standards, as determined from both the signal/noise and distortion results and as confirmed by the pink noise spectrum analysis. Sensitivity is a little low, yet the response shape shows a typical top end lift, so any Dolby tracking integrity problems should be inaudible on IEC aligned decks. Yet the listening results seemed to defy this simple analysis.

Not a particularly engaging tape to listen to, *MG-X* made rather syrupy recordings on a machine set up to IEC. The bass sounded heavy and the midrange confused, and this was partly attributable to Dolby mistracking due to the sensitivity error, but was also a function of a treble sounding less than transparent.

Sensitivity: +1.0dB. **Signal/noise:** 48.5dB for 0.6% THD. **10kHz compression:** 0.5dB.



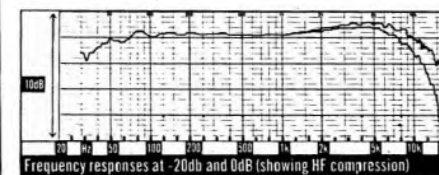
THAT'S MR-X PRO

In contrast to the cheaper That's Type IV, *MR-X Pro* has a sensitivity figure just above the line and an improved signal/noise ratio. The overall dynamic range is excellent - within spitting distance of the Sony metals. However, noise modulation is disappointing. The response shape is typical of metals in being lifted at high frequencies, though not sufficiently so to result in a significantly bright balance in a well set-up cassette deck (which many unfortunately aren't, on metal especially). Compression is low.

The one quality this tape possesses above all others is precisely the one that is absent from practically all That's' remaining tapes - compatibility. This tape can be slotted in where a TDK, Fuji or other compatible tape normally goes.

Sonically undistinctively good, the mid-band sounded slightly thin and occasionally 'pinched', and there were odd flashes of brashness, but nothing extraordinary. The tape has decently low noise, and can be used without Dolby C, which tends to be advantageous.

Sensitivity: +0.3dB. **Signal/noise:** 51.0dB for 0.5% THD. **10kHz compression:** 1.1dB.



TAPES: CONCLUSIONS & RECOMMENDATIONS

Concluding the tests with a run-down of the best performers

A quick comparison between the results of this tape test and the last one undertaken in 1987 suggests that change has been evolutionary rather than revolutionary; consequently there are few real surprises.

The poorer ferric tapes tend to sound rather cuddly and loose, at the frequency extremes especially. They are tonally rather dull as a breed, and the lower output tapes also suffer from compromised Dolby tracking.

Another generalisation, but a useful one, is that the more sensitive tapes are the more alive, vital and - in short - better sounding ones. There is a tendency for sensitive tapes to sound a little bright (not universally true, as TDK *SA-X* in particular demonstrates), but they are also the ones that give the widest operating dynamic range (nine times out of ten anyway).

Type Is continue to show the greatest range of variation between brands and types - predictably since this is where the budget tape suppliers find their richest pickings. **Fuji FR-IS**, **JVC UFI** and **Memorex MRXIS** all impressed as good, compatible tapes. **MRXIS** is a little compressed at high levels and high frequencies and is slightly noisy too. **Sony HF** has similar characteristics, but is also a little coloured and low in sensitivity; it's available cheaply though, and can be recommended for many less critical purposes.

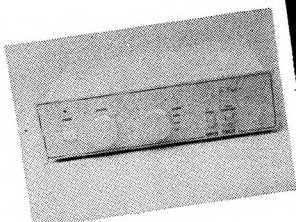
Amongst the premium types, the front runners include **TDK AD**, which has extremely good compatibility, has an even wider operating dynamic range, as wide as any tape, but it is also very sensitive - a characteristic shared by **Sony HF-S** and **HF-ES**. These last three are unquestionably amongst the most exciting of all ferrics, but do need special bias, EQ and sensitivity settings before giving of their best. With the dynamic range of most metals but poor Dolby compatibility, **AD-X** and **HF-ES** are particularly well adapted for use on an inherently quiet recorder without noise reduction, perhaps with Dolby *HX-Pro* (which works best with Type Is). **That's TX** and **FX** attract similar comments and are well worth trying, but in the final analysis they seem less consistent than the best of their competition.

TYPE II

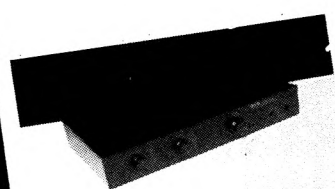
Amongst the Type IIs, the age old split between the low sensitivity chromes and the high sensitivity super-ferrics continues unabated, with the pure chromes looking ever more out on a limb on compatibility grounds. This was always inevitable of course, with chrome tape manufactured exclusively in Europe and the super ferrics and the hardware industry concentrated predominantly in Japan.

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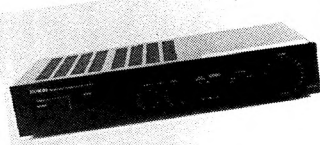
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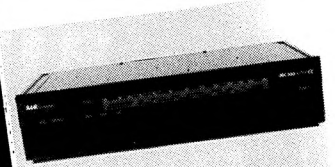
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CONCLUSIONS

TYPE I FERRICS

Tape	Sensitivity	Noise ref IEC dB	THD 400Hz	3% THD	Saturation 40Hz	4kHz	Noise Modulation	Compression 10kHz
Agfa F-DX1	-0.4dB	-46.5dB	0.9%	+7dB	+6.5dB	+7dB	-38dB	4.8dB
Agfa F-DX1S	-1.1dB	-48dB	0.9%	+6dB	+6.5dB	+8dB	-39dB	3.8dB
Boots Ferric I	-0.2dB	-47dB	0.8%	-8dB	-8dB	+6.5dB	-43dB	4.4dB
Boots Super Ferric I	-0.6dB	-46dB	0.8%	-7dB	-6.5dB	+7dB	-42dB	4.5dB
Dencn DX	-1.4dB	-46dB	0.9%	+5.5dB	+4.5dB	+6dB	-41dB	>4.0dB
Fuji FR-IS	+0.2dB	-47dB	0.9%	+10dB	+9dB	+8dB	-40dB	4.0dB
Fuji DR	-1.6dB	-48dB	0.9%	+5dB	+5dB	+6dB	-42dB	3.6dB
Goldstar HD	-0.7dB	-45.5dB	0.9%	+6dB	+5dB	+7dB	-41dB	4.8dB
Goldstar HR	-0.5dB	-45dB	0.9%	+7dB	+5.5dB	+7dB	-43dB	5.1dB
JVC UF1	+0.3dB	-49dB	0.8%	+8.5dB	+8dB	+8dB	-37dB	4.0dB
Maxell UDI	+0.5dB	-48dB	0.8%	+9dB	+9dB	+8dB	-41dB	4.8dB
Maxell XLI	-0.4dB	-48dB	0.8%	+7dB	+8dB	+8dB	-42dB	4.2dB
Maxell XLI-S	-0.2dB	-49dB	0.8%	+6.5dB	+7dB	+7dB	-38dB	4.5dB
Memorex dBS	-0.5dB	-47.5dB	0.8%	+6dB	+6.5dB	+6.6dB	-38dB	4.5dB
Memorex dBSI	-0.7dB	-48dB	0.8%	+6.5dB	+5.5dB	+6dB	-38dB	>3.8dB
Memorex MRXIS	+0.1dB	-46.5dB	0.8%	+8.5dB	+8dB	+7dB	-39dB	5.3dB
Realistic Low Noise	-0.5dB	-48dB	0.8%	+7dB	+6dB	+6dB	-38dB	4.5dB
Realistic Gold Plus	-0.6dB	-46dB	0.9%	+7dB	+6dB	+6.5dB	-45dB	5.5dB
Sony HF	-0.5dB	-46dB	0.8%	+7.5dB	+7dB	+7dB	-42dB	0.8dB
Sony HF-S	+0.4dB	-48dB	0.8%	+9dB	+8dB	+8dB	-41dB	4.8dB
Sony HF-ES	+0.8dB	-48.5dB	0.8%	+9.5dB	+8dB	+8dB	-42dB	4.4dB
TDK AD	+0.2dB	-54dB	0.8%	+8dB	+7dB	+8dB	-40dB	4.4dB
TDK AD-X	+0.8dB	-53dB	1.0%	+10dB	+9.5dB	+8dB	-37dB	4.5dB
That's FX	+0.6dB	-47dB	0.9%	+9.5dB	+8dB	+8dB	-43dB	5.4dB
That's TX	-0.3dB	-46dB	0.8%	+8dB	+7dB	+7dB	-43dB	4.8dB

TYPE II CHROMES

Tape	Sensitivity	Noise ref IEC dB	THD 400Hz	3% THD	Saturation 40Hz	4kHz	Noise Modulation	Compression 10kHz
Agfa CDXII	-2.1dB	-54dB	1.0%	+4dB	+4dB	+2dB	-43dB	2.4dB
Agfa CDXIIS	-0.6dB	-54dB	0.9%	+6.5dB	+8dB	+3dB	-39dB	2.2dB
Fuji FR-II	0dB	-52dB	0.6%	+7dB	+6.5dB	+6dB	-39dB	2.0dB
Fuji FR-II Super	+0.3dB	-52dB	0.6%	+7.5dB	+8dB	+6dB	-39dB	2.1dB
JVC UFII	+0.3dB	-53.5dB	0.7%	+6.5dB	+7.5dB	+6dB	-37dB	2.3dB
Maxell UDII	0dB	-51.5dB	0.9%	+5dB	+7.0dB	+5dB	-44dB	2.2dB
Maxell XLII	-0.4dB	-52.5dB	0.8%	+5.5dB	+7dB	+5dB	-42dB	2.0dB
Maxell XLII-S	+0.7dB	-53.5dB	0.9%	+6.5dB	+7.5dB	+3.5dB	-44dB	3.6dB
Memorex HBXII	-0.1dB	-52.5dB	0.7%	+6dB	+6dB	+6dB	-37dB	1.8dB
Memorex CDXII	+1.2dB	-50.5dB	1.1%	+6dB	+10dB	+7.5dB	-40dB	1.2dB
Memorex CRXII	-0.8dB	-51dB	1.0%	+4dB	+6dB	+5dB	-44dB	2.4dB
Sony UX-ES	+0.2dB	-52dB	0.6%	+7.5dB	+9dB	+7dB	-42dB	1.8dB
Sony UX-Pro	+0.4dB	-52dB	0.5%	+8dB	+9dB	+7dB	-41dB	2.0dB
Sony UX-S	+1.0dB	-50.5dB	0.7%	+7.5dB	+8dB	+5.5dB	-41dB	2.4dB
TDK SF	-0.2dB	-53dB	0.8%	+6dB	+7dB	+5dB	-40dB	2.4dB
TDK SA	0dB	-53.5dB	0.7%	+6dB	+7dB	+5.5dB	-41dB	2.1dB
TDK SA-X	+1.1dB	-55dB	0.7%	+6.5dB	+7dB	+4.5dB	-40dB	3.8dB
That's EX	+2.4dB	-49.5dB	1.0%	+7dB	>+10dB	+8dB	-42dB	1.3dB
That's EM-X	+2.3dB	-50dB	1.0%	+7dB	>+10dB	+8dB	-42dB	2.3dB
That's VX	-0.5dB	-53dB	0.7%	+5.5dB	+6.5dB	+5.5dB	-44dB	2.0dB

TYPE IV METALS

Tape	Sensitivity	Noise ref IEC dB	THD 400Hz	3% THD	Saturation 40Hz	4kHz	Noise Modulation	Compression 10kHz
Fuji FR Metal	-0.4dB	-49.5dB	0.6%	>+10dB	>+10dB	+10dB	-40dB	0.9dB
Maxell MX	-0.7dB	-51dB	0.5%	+10dB	>+10dB	+9.5dB	-43dB	1.0dB
Sony ES	+0.8dB	-52.5dB	0.4%	>+10dB	>+10dB	+9.5dB	-44dB	1.4dB
TDK MA-X	0dB	-51.5dB	0.5%	>+10dB	>+10dB	+10dB	-44dB	1.1dB
TDK MA-XG	-0.2dB	-51.5dB	0.5%	>+10dB	>+10dB	+10dB	-42dB	1.1dB
That's MG-X	-1.0dB	-48.5dB	0.6%	>+10dB	>+10dB	+9.5dB	-43dB	1.5dB
That's MR-X Pro	+0.3dB	-51dB	0.5%	>+10dB	>+10dB	+10dB	-40dB	1.1dB

Amongst the better types, **Fuji FR-II**, **IIS** and **TDK SA** are excellent, compatible designs and are recommended. **JVC UFII** is another good tape which manages a better dynamic range than **TDK SA** (just), but which suffers rather high modulation noise and consequently sounds a bit ragged. **Maxell's** budget Type II, **UDII**, is also compatible, though slightly lacking in top end energy; this could be useful in certain systems but a liability in others. It's just slightly noisy too, but modulation noise is low and it is a fine, clear sounding tape.

TDK's equivalent is **SF**, which offers near ideal compatibility. Again, it's a good tape and excellent value, with parameters sensibly similar to **SA** but lagging just behind on most counts. Contrast this hierarchical approach to range building to the 'growth through diversity' approach exemplified in the **Memorex** Type II collection where there's a (presumed) super-ferric (**HBXII** - compatible, but the test tapes were slightly erratically coated), a metal (**CDXII** - wildly incompatible, and expensive) and a chromium dioxide (**CRXII** - excellent sound, slightly low sensitivity by non-chrome standards).

Of course **That's** made their name with their metal Type IIs; but they also now make a very good conventional Type II called **VX**. The metal Type II **EM-X** is recommendable too if you like living dangerously or have a deck with adjustable everything (or an aspirin dispenser). The real stars, however, are tapes like **Maxell XL-IIS**, which is sensitive at mid and high frequencies especially and therefore benefits from a little tweaking; and **Sony UX-ES** and **UX-Pro**, again a little over sensitive but with superb headroom and low noise. **TDK SA-X** can be added to this trio, unusually favouring the bass, but highly sensitive.

TYPE IV

The metals are consistently capable of the best sound quality, especially in their clarity and freedom from dynamic compression. There are no real duds here, but **Fuji FR Metal** has a slightly falling top and lowish sensitivity along with a rather high noise floor and consequently narrowed dynamic range. **Maxell MX** too has lowish sensitivity, but is brighter and more compatible. **Sony Metal-ES** and **That's MR-X Pro** err in the opposite direction. They can sound rather bright and thin, with some HF compression. In between are the **TDK** metals; **MA-X** is rather better value than **MA-GX**, which is scarcely better but is certainly more expensive.

Finally, it's worth noting that proprietary, own-brand tapes generally fared relatively poorly, so it seems appropriate to treat them with a certain amount of suspicion. Try one before buying any quantity seems safe advice. This is the case even with the nationally known brand names; the no-namers obviously should be avoided at all costs since in extreme cases (not *that* extreme!) they could even compromise the cassette deck.

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METAL POSITION (TYPE IV) **MR-X90PRO**

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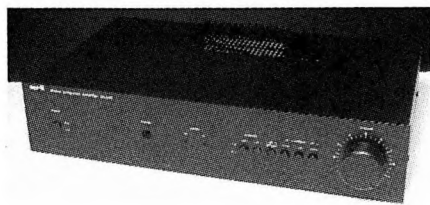
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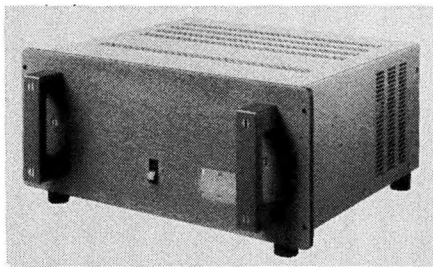
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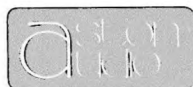
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CHOOSING AND USING...PERSONAL STEREOS

In the never ending quest to stretch the limits of hi fi reviewing, *Choice* this month delves into the previously uncharted waters of personal stereos, bringing you the word on twenty of these so called 'boogie packs'.

Since the introduction of the Sony *Walkman* in the early 'eighties, the market has become saturated with a vast assortment of players. Which is good for competitive pricing, but bewildering if one is trying to select a reasonable quality machine.

The players selected for this review are mostly sub £100 models from the major names in the field. Some very cheap models did turn up, but were excluded on mercy grounds. In retrospect it might have been better to have gone for even more of the upmarket models. But that would have had to have been at the expense of the real marketplace.

THE REVIEWS

The listening tests were carried out using the Sony *ProWalkman WM-D6C* as a reference. This is the same model that Alvin Gold reviewed in the last *Hi-Fi Choice: Cassette Decks and Tapes* (No. 52), but I have also presented my impressions of this cult object as a guideline for the other reviews.

Each player was listened to with its accompanying head or earphones, and also with a pair of Jecklin *Float Model Two* headphones, kindly lent by Presence Audio.

Both Musicassettes and home recordings were used. On units that were appropriately equipped, recording abilities were also tested, using voice and an external source where possible.

The Musicassettes included: Dvorak *Cello Concerto in B minor*, Opus 104 (Deutsche Gramophon 415 330-4), Mozart *Oboe Concerto in C*, K.314 (Philips 7300 119), and for some real pop The Housemartins *London O Hull 4* (Go! Discs ZGOLP 7). The home brewed recordings included rock music and acoustic guitar tracks. Alkaline batteries were used to power all the machines.

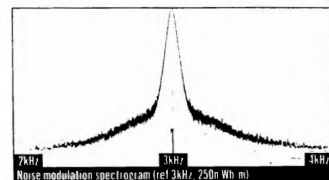
LAB TESTS

In order to playback a pre-recorded cassette without audible distortion, the player must be able to transport the tape over the head at a constant speed of 4.75 cms/second. If the mechanics of a player are poor, and/or the power supply is not very clean the result will be a slight jerking of the tape over the heads which can be heard as flutter.

If the capstan, pulling the tape across the head by pressing against a pinch wheel, is not perfectly straight and round, it will create short term speed fluctuations known as wow.

Peak DIN weighted tests were carried out for wow and flutter, both individually and as a combination. The results obtained for the various players are printed at the end of each review, but for comparison purposes a group average was calculated as follows: wow and flutter - 0.36%; wow - 0.23%; flutter - 0.52%. Also included is an indication of absolute speed accuracy. All the decks were found to run a little fast - possibly to allow for battery power depletion.

The noise modulation spectrogram was created by playing a 3kHz test tone tape in each machine and passing the output to a spectrum analyser, albeit with less resolution than the similar test used in *Choice's* cassette deck reviews. The results of this particular test are quite subtle in most cases, and we are reproducing the spectrogram from a Nakamichi *Dragon* for comparison purposes. From that one can see that apart from a



constant and steep build up to the peak, a very important element is the linearity of the line that makes up the peak itself. Only the *ProWalkman* achieved anything like the *Dragon's* smoothness.

Finally, my thanks are due to Alvin Gold who lent expertise and test equipment.



PA-7E POWER AMPLIFIER

PHOTO: LIAM WOOD

Watts in fashion.



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AIWA HS-G35 Mk II

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AVENUE, LONDON W3 0SY. TEL: (01) 993 1672.



The £35 Aiwa *HS-G35* is the top selling branded personal stereo on the market, and it's not hard to tell why. Most purchases of machines in this price range are based more on looks and features than sound quality, and this one looks positively slick next to a lot of the competition. Much like the current midi system fashion, finish is black with details in grey and chrome. It features autoreverse, a three-band graphic equaliser (obviously an important sales point) and metal tape compatibility.

The headphones are apparently the same as those included with the more expensive *J36* model, *ie* nothing special. The suitably scaled transport controls are mechanical, but have a degree of logic, making it possible to switch straight from play to fast forward. One minor operational criticism of this and several other Aiwass is the rather limited extent to which the lid opens when the eject button is pushed. Other designs get round this by not having a lid catch, though that may not be such a bright solution as I recently noticed a friend using masking tape to hold the lid of his player closed.

LAB REPORT

Quite why the *G35* failed to respond to the noise modulation spectrum test in the same way as the other players remains a mystery. What it did produce looked promising, but should not be relied upon for judgement.

Unfortunately the wow and flutter results don't seem to correlate. They are worse than the not so great group average, and are probably a better indication of performance than the graph. Absolute speed at 1.13 per cent fast is fair enough for the price, but hardly commendable.

SOUND QUALITY

The *G35* isn't particularly revealing, and stereo separation could have been better, tending to create an 'in the head' sound with some material. However, taking the price into consideration this is a quite enduring, even musical player. Granted acoustic instruments can sound a bit flat and anaemic, but both hiss and wow levels are restrained to a bearable degree. The standard of fidelity is better suited to pop material, which sounds lively and not too congested, making the most out of better recordings.

Unlike many inexpensive models this Aiwa doesn't seem to have a wearing effect on the listener – in other words, half an hour's listening shouldn't give you a headache. This fairly important element is enough to warrant Recommendation in itself. But on most material the highish flutter shows through, rather messing up the sound.

CONCLUSIONS

As sub-£40 tape players go this is half decent, giving reasonable sound quality and a good noise threshold.

TEST RESULTS

Weighted wow & flutter	0.52%
Weighted wow	0.31%
Weighted flutter	0.56%
Speed accuracy	+1.13%
Weight	310g inc
Price	£35



AIWA HS-J36

AIWA (UK) LTD., UNIT 2, DUKES ESTATE, WESTERN

AVENUE, LONDON W3 0SY. TEL: (01) 993 1672.



The £90 *HS-J36* is a nicely built autoreverse, radio, record/replay machine, designed in domestic cassette deck style with a wide selection of small buttons and switches – perhaps too small for the less deft amongst us. Many mode switches were most easily manipulated with a fingernail – I guess the Japanese have smaller digits than us.

It has all the usual functions one might expect of a player at this price, plus the ability to make recordings from either the FM/AM radio, the built-in monaural microphone or an external stereo mike (not supplied). Dolby operates, but on playback only, and the headphones are pretty basic supra-aural models built by (or for) Aiwa. An attractive little detail is the three rubber feet on one end of the player that avoid marking surfaces.

LAB REPORT

Being a manufacturer of some note in the domestic cassette field, one might expect a better than average performance standard from Aiwa's personal stereos. In the lab at least this proved to be the case, the spectrogram being very clean and reasonably narrow at its peak, which bodes well for its sonic abilities. The wow and flutter figures are also very impressive, being better than or equal to all but the Pro-Walkman. Wow individually is a particularly good 0.12%, close to the realms of inaudibility. Absolute speed is no embarrassment either at 0.3%, which will only be detectable as a lack of absolute timing precision.

SOUND QUALITY

With rock music the sound had a rhythmic coherence and instrumental organisation that is quite rare amongst these machines. As

usual the headphones are a tonal and ambient limitation. A better pair revealed a feasible bottom end and real dimensionality to voices and instruments. One gets some sort of look-in on the notions behind songs, which is a rarity in this medium. Unfortunately these comments apply with the Jecklin *Float* headphones; those that come with the player aren't quite so illuminating, but the strengths exist all the same.

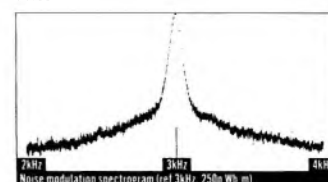
The Dolby seems to work a bit better than normal and is quite useable with classical musicassettes (which can sound a bit grating in the extreme treble). The *J36* was more critical of tapes than most other machines, not getting on that well with commercial offerings, which is partly due to good clarity but also could indicate a frequency response that strays from the standards (as no doubt a lot of these machines do – it's just that most don't audibly reveal the fact). The most difficult sustained notes do show up some wow, but for the most part this blemish is inaudible.

CONCLUSIONS

The *HS-J36* is a revealing and coherent little machine that sounded more at home with non classical music, but deserves Recommendation nonetheless.

TEST RESULTS

Weighted wow & flutter	0.23%
Weighted wow	0.12%
Weighted flutter	0.32%
Speed accuracy	+0.3%
Weight	285g inc
Price	£89

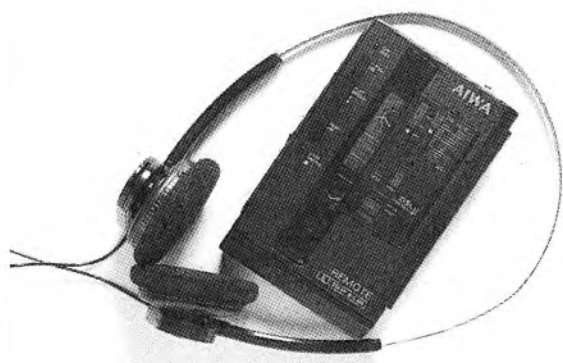


RECOMMENDED

AIWA HS-PX101

AIWA (UK) LTD., UNIT 2, DUKES ESTATE, WESTERN

AVENUE, LONDON W3 0SY. TEL: (01) 993 1672.



The *PX101* is a very attractive machine – *ProWalkman* excepted, it's the most wicked looking player in the review. Available in any colour as long as it's black, it features electronic transport controls and a selection of small but easily manipulated mode switches, including Dolby B and C. A pair of what Aiwa call DSL controls (in effect tone controls) are sited on the tape compartment lid; unusually these can be switched out of circuit if not required.

Like a lot of domestic machines, a sensing device detects gaps in the music of four seconds or more, which makes accessing the start of individual tracks far easier. The serious looking headphones have an in-line remote control device (!) which can adjust volume, and also stop or change tape direction when switched on at the machine (these latter functions requiring a second jack plug). I guess it could be useful when the player is kept in a pocket.

The *PX101* is a 3 volt machine and will run off two AAA batteries or a rechargeable lead battery, both of which have separate clip-on cases. Inevitably this sort of style and sophistication does not come cheap: in fact it costs £149.

LAB REPORT

The noise modulation graph shows a reasonable 3kHz peak, a bit unclear but not seriously so. It also shows a couple of sidebands at approximately 2 and 4kHz. The wow and flutter results are reasonable but not as good as one might have hoped for, flutter in particular being worse than average. Absolute speed control was a bit better at a presentable 0.36% fast.

SOUND QUALITY

Improved headphone quality

gives an instant advantage, and the *PX101* was one of too few players to present a flattish tonal response. Unfortunately some wow and flutter was detectable with the Mozart which was otherwise played with aplomb and clarity. A refined and subtle sonic quality makes it particularly suited to classical works, allowing the music to breathe and unfold in a quite convincing manner.

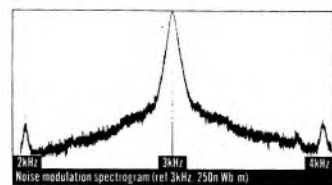
However, the sound lacked a little of the incisive edge and punch that best suits rock music. When comparisons were made with the *ProWalkman* (which costs nearly twice as much) there seemed to be a lack of solidity and coherence. But the extra body and depth provided on familiar tracks still made a worthwhile improvement over less expensive machines.

CONCLUSIONS

If you fancy a compact and stylish player you need look no further. The sound quality is also impressive, and in the context of the competition it gets our Recommendation with the hope that other samples might return better wow and flutter performance.

TEST RESULTS

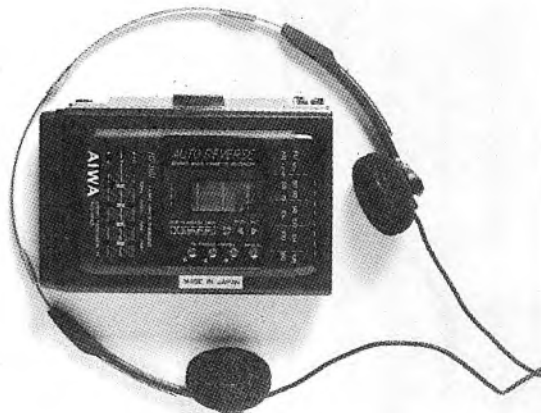
Weighted wow & flutter	0.30%
Weighted wow	0.15%
Weighted flutter	0.52%
Speed accuracy	+0.36%
Weight	214g
Price	£149



AIWA HS-J101

AIWA (UK) LTD., UNIT 2, DUKES ESTATE, WESTERN

AVENUE, LONDON W3 0SY. TEL: (01) 993 1672.



The *HS-J101* is the most gadget-laden Aiwa volunteered for this review project, and is the only model herein that features electronic radio preset tuning. There are three such presets each has its own separate tuning knob discreetly hidden under a panel. The tuning dial itself is fairly novel, with a series of eight LEDs instead of the usual cursor bar. Unlike other, cruder preset systems, the wavelength of each preset is indicated.

What else do you get for your £170? The four-band graphic, Dolby processing, auto-reverse and metal tape compatibility are all common enough these days; more important, the *J101* is a recorder. It will record onto Type I tapes only, from either the radio or from an external stereo microphone, which is included in the package. There is no line input, so it is not possible to record from a normal external source like the domestic amplifier.

The foldable headphones otherwise closely resemble those found with cheaper Aiwass. Power supply is either from twin (expensive) triple As, or the rechargeable lead acid battery supplied complete with charger.

LAB REPORT

The speed stability spectrogram is fairly clean with reasonably linear definition on the main peak; the smaller peak at around 2500Hz is probably a flutter element. Wow and flutter results are quite healthy, the flutter in particular measuring the best of the lot, including the reference. Wow was also very good and hardly apparent on audition, though absolute speed at over 1 per cent fast was a little disappointing.

SOUND QUALITY

Not surprisingly the *J101* sounds

a little fast when compared with other players, and consequently tended to sound slightly bright and lively. Using the supplied headphones the tonal balance is upper-mid forward. The treble sounds particularly clean – no doubt as a result of the low flutter. Bass notes sound rather shallow and lacking in weight, but this is more a limitation of the headphones than the player; the reference *Float* headphones revealed a quite reasonable bottom end.

The *J101* seemed to be equally at home with both rock and classical music, revealing the subtlety of the latter and the punch of the former. Dolby worked reasonably well, but nevertheless had a detrimental effect on the 'life' of the music. Voice recording on the other hand could well have benefitted from some noise reduction, as it was plagued by hiss and motor noise.

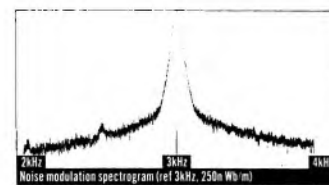
Results from the radio were quite adequate. FM radio sensitivity seemed only about par, but AM was reasonably good, and having three presets is a boon.

CONCLUSIONS

Whilst lacking the strict dedication to cassette of the *PX101*, this radio player/recorder is still a nice machine with some handy features.

TEST RESULTS

Weighted wow & flutter	0.25%
Weighted wow	0.14%
Weighted flutter	0.30%
Speed accuracy	+1.2%
Weight	280g inc
Price	£169.95



FERGUSON 3T46

THORN-EMI FERGUSON, CAMBRIDGE HOUSE, CAMBRIDGE ROAD, ENFIELD, MIDDLESEX EN1 1UL. TEL: 01-363 5353.

RECOMMENDED



The £34.99 3T46 is the most expensive of a range of three Fergusons that were sent in for evaluation. All share the *Escort* model name and come in a variety of colours including ubiquitous black, a suitable hi-fi colour for a hi-fi magazine. The *Escort's* appearance is pretty utilitarian in the traditional Ferguson mould, which I admit to finding subjectively a bit tacky.

The 3T46 is one of too few players to allow a good view of the cassette whilst it's playing, albeit unfortunately disguising the name tag. Alongside the basic autoreverse deck there is an FM and MW radio with a rather cramped dial, and a stereo indicator (in case you can't tell). The headphones are your regular earbushers of no identifiable manufacture, with a frequency range that fits somewhere in between midrange and treble.

LAB REPORT

The noise modulation spectrogram is better than might have been expected, but the peak is quite broad based and lacking in resolution – denoting the cost restraints that limit the mechanical quality of the machine. The wow and flutter results are about average, a little worse on wow but quite a lot better than most on flutter at a surprising 0.38%.

Absolute speed on the other hand measured a monstrous 3.63% fast, which I expected to be subjectively a lot more obvious than proved to be the case. Unless it's a familiar piece of music (or you've got perfect pitch) the most notable effect is a slight increase in the pitch of notes. Of course comparisons make this failing considerably more apparent.

SOUND QUALITY

Most of the usual speed stability

problems were quite audible, but overridden by a painful, 'grainy' element to the sound which made extended listening rather an uncomfortable experience. In this respect, a duller sound would have been preferable, and a graphic equaliser might have helped for once.

I managed to put up with the brashness for a while, and found the 3T46 a lively and reasonably clear player. Subtlety wasn't really its trademark, but it was possible to identify various instruments and follow lyrics. One odd characteristic was that it sounded a lot more palatable with home brewed tapes than with Musicassettes. The latter sound obviously worse under any circumstances, but not to the gritty earpiercing degree found here.

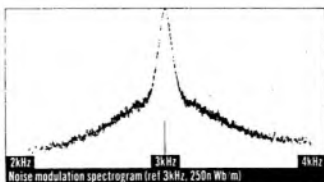
FM radio sensitivity was reasonable, but noise in between stations made tuning a grisly affair. Medium wave was extremely noisy and hard to tune in.

CONCLUSIONS

To be honest it is possible to do better for the money, but if you've got robust ears and a preference for pop music the 3T46 should prove adequate.

TEST RESULTS

Weighted wow & flutter	0.32%
Weighted wow	0.29%
Weighted flutter	0.38%
Speed accuracy	+3.63%
Weight	320g
Price	£34.99



JVC CX-7

JVC (UK) LTD., 12 PRIESTLEY WAY, ELDONWALL

TRADING EST., STAPLES CORNER, LONDON NW2 7AF.

TEL: 01-450 3282.



The CX-7 is an unusual player because the tape compartment lid shuts in one position when empty and another when playing or containing a cassette. In much the same way as an expanding briefcase, the CX-7 is smaller when empty – not much smaller though. Otherwise it's quite a minimalist affair, with touch sensitive transport controls, three autoreverse modes, Dolby and metal tape compatibility.

The styling adopts a very different approach from the average personal, the main carcass being finished in a glossy graphite with details in aquamarine. It actually looks worth the £111 asking price, and may therefore appeal to people who usually dislike these machines. The lid contains the playback head which faces upwards when open, making head cleaning relatively easy. The player runs off a single 1.2 volt rechargeable battery that is supplied along with a charger (which must account for a good tenner's worth of the price). The headphones are the usual cheap OEM jobbies.

LAB REPORT

The general shape of the noise modulation graph looks fairly healthy, but the peak definition could have been better and indicates a less than rock solid transport, but with only one and a bit volts to play with that's hardly news. Wow and flutter levels were reasonable, flutter being the better at only 0.36%. The combined figure isn't great though, and wow was audible on certain tracks.

Absolute speed was a bit on the fast side (plus 0.8%), but not to a particularly noticeable degree unless comparisons with better players were made.

SOUND QUALITY

On audition this was a quite informative and agreeable little player, capable of extracting some of the depth in a recording despite the limitations of the 'phones. The CX-7 seems to be a step in the right direction, as it can deal with the tonal limitations of its ancillaries and sound quite clean – even dynamic at times.

The most critical material could show up shortcomings in speed stability, but not to an annoying or unpleasant degree. The low flutter content definitely improves the top end; though a bit rolled off, this represents a good compromise with hiss only showing through on the quietest passages.

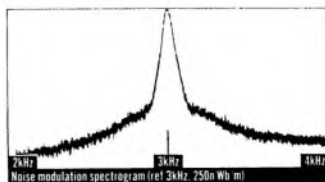
It is one of few players to do justice to both classical and rock music, and only direct comparison revealed some lack of solidity and subtlety in the sound. Dolby seems a little out of place, and has the usual derisory effects, but is no doubt a necessary sales feature.

CONCLUSIONS

The JVC CX-7 is an attractive and musically enjoyable player, and offers reasonable value for money – worth considering.

TEST RESULTS

Weighted wow & flutter	0.30%
Weighted wow	0.18%
Weighted flutter	0.36%
Speed accuracy	0.8%
Weight	195g
Price	£111



Hi-Fi experience (eks-pē'-ri-ens) *n.* practical knowledge gained by trial or practice; personal proof or trial; continuous practice; evidence; an unusual event in one's life;—*v.t.* to know by personal trial or practice; to undergo; to feel; to endure; to encounter.—*expe'rienced a.* skilled; expert; wise; capable; thoroughly conversant with.—*experien'tial a.* relating to or having experience; empirical [L. *experiri*, to test].

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Leamington Spa

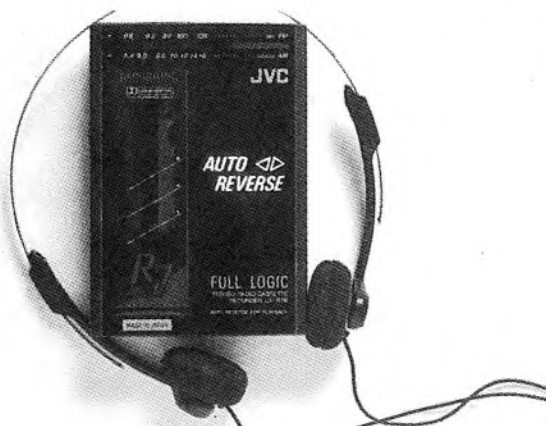
49 Park Street,
Leamington Spa, Warks.
Tel: 0926 881500

JVC CX-R7K

JVC (UK) LTD., 12 PRIESTLEY WAY, ELDONWALL

TRADING EST., STAPLES CORNER, LONDON NW2 7AF.

TEL: 01-450 3282.



JVC's CX-R7K is more conventional in appearance than its less expensive brother, and sports a bewildering array of tiny buttons and switches. The price tag is an impressive £188, which includes the rechargeable batteries and charger, a little case, belt clip, etc. The transport controls are full logic, touch sensitive devices that take a bit of getting used to, but are quite nice to use.

One reason for the high price is that this is a recorder as well as player, and can record in either stereo or mono using the accompanying remote microphone. Of course it also has a comprehensive complement of other functions including Dolby (playback only), three mode autoreverse, and a two band radio. It also has the distinction of being the easiest player to insert batteries into, but as one charges the things *in situ* this ergonomic ingenuity may go unappreciated.

LAB REPORT

The spectrogram created by the CX-R7K has a quite good overall shape with a reasonably narrow 3kHz peak and not too great an area underneath. It lacks the linearity of the ProWalkman reference, but we are still £100 off the latter's asking price. The wow and flutter results were not too hot though; 0.28% wow is poorer than the group average, and this is the second most expensive player under scrutiny.

Absolute speed was also rather poor at over one per cent fast. These results may be put down to a bad sample, but are still indicative of dubious quality control.

SOUND QUALITY

The factor that really counts in the long run is sound quality, and here the R7K was pretty good. It

was one of very few that sounded both open and detailed whilst also retaining a relaxed nature. It could make bass lines walk when appropriate, but not really give them body, though the rhythmic and musical qualities made up for inadequacies in solidity.

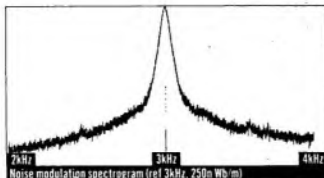
Wow was audible, but not to the extent that the figures suggested, and it was possible to listen to quite fussy material without much aggravation. However, classical Musicassettes tended to sound a bit 'gritty', and guitar tracks showed up the absolute speed problem. The rather tinny headphones exaggerated the slightly grainy nature of some tracks, so a better pair are really a must. On the other hand a *Talking Heads* album side on TDK sounded great.

CONCLUSIONS

This JVC proved a bit of an oddity. It could sound excellent on occasions, but mediocre on others. A bit more consistency would have seen it recommended.

TEST RESULTS

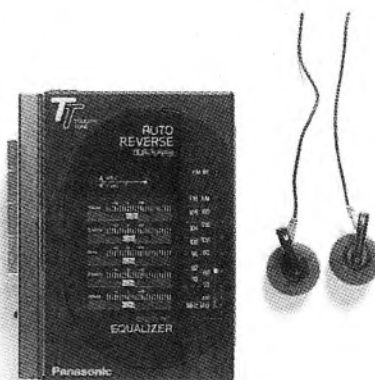
Weighted wow & flutter	0.30%
Weighted wow	0.28%
Weighted flutter	0.42%
Speed accuracy	+1.3%
Weight	247g
Price	£188.77



PANASONIC RX-SA78

PANASONIC UK LTD., 300-318 BATH ROAD, SLOUGH,

BERKS SL1 6JB. TEL: (0753) 34522.



For 5p less than one hundred pounds you could take away Panasonic's RX-SA78, a comprehensively featured, radio-equipped machine whose looks don't quite seem to tally with the price - which could have its advantages.

In the true Panasonic fashion the SA78 sports a five-band graphic equaliser, allowing full tonal control to make what you can out of your favourite tapes. With fingers firmly on the pulse of the personals market, Panasonic include a pair of intra-aural ear plug style phones, upholstered with rather large removable foam covers (the latter proving a tight fit even in my less than shell likes).

Other novelties include an FM/AM radio featuring 'touch'n'tune' - which is one way of describing a single preset I guess, but doesn't quite conjure up the fiddly little rotating dial that has to be tuned in. Otherwise the player is pretty much par for the course, with the usual autoreverse, metal type switch and Dolby.

LAB REPORT

The noise modulation spectrogram is less than exemplary at the price, being fairly rough and uneven with a significant area under the peak, which usually indicates less than wonderful mechanical engineering. The wow and flutter results weren't so good either, being below the group average throughout, and especially bad in combination at 0.48%. Absolute speed at 2.6% fast is competing with the sub-£40 models.

SOUND QUALITY

To be honest the SA78 displays most of the sonic failings common to the genre: audible wow,

fast tempi and limited bass, to mention the most obvious. The earphone type transducers are more of a limitation than normal, and tape hiss was particularly prominent - Dolby seemed to have little effect upon this hiss, preferring instead to eradicate information at a higher frequency.

A more palatable pair of headphones didn't seem to help matters much, though they did cut down on the hiss. However, the grainy, often painful treble was still too imposing for a lot of music. Using the graphic it was possible to arrive at a rather full, 'boxy' sound, which helped the listenability factor but constrained the musical one.

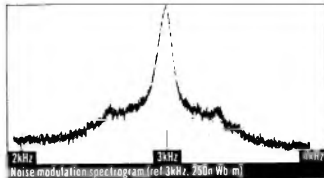
Not surprisingly, radio was a lot more satisfactory when the desired station was located, if a bit noisy in between, the single 'touch'n'tune' preset being useful in this respect. Both FM and AM were about average quality, which in this case means that AM was difficult to use.

CONCLUSIONS

Not a favourite player I must admit, noise was a problem throughout. With a little research you could do better for less.

TEST RESULTS

Weighted wow & flutter	0.48%
Weighted wow	0.28%
Weighted flutter	0.54%
Speed accuracy	+2.6%
Weight	270g
Price	£99.95

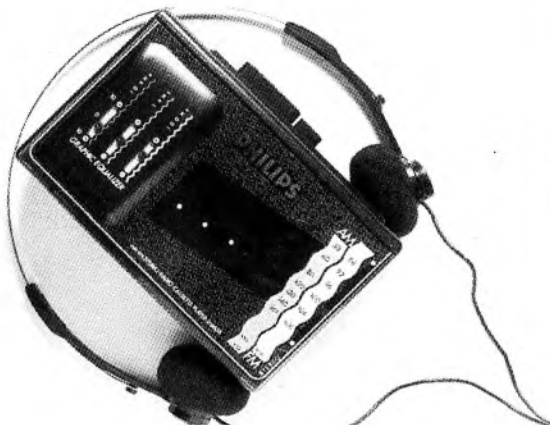


PHILIPS D6658

PHILIPS ELECTRICAL LTD., CITY HOUSE, 420-430

LONDON ROAD, CROYDON, SURREY CR9 3QR.

TEL: 01-689 2166.



Philips' *D6658* is a £30 personal aimed accurately at the teenage market. The black plastic box decorated with purple and green legends looks marginally better than bald description suggests, the obligatory three-band graphic even displaying a bit of post modern styling. Functionally it is pretty basic with only the FM/AM radio switches to fiddle with.

The headphones are pretty much bog standard OEM-type devices. The unit itself looks very similar to the cheaper Toshiba, but fortunately doesn't have the same noise problems. So there could be an electronic difference between the two if nothing else. The *D6658* runs off two AA batteries and won't accept an external power supply – a trait of low cost machines.

LAB REPORT

The transport mechanical integrity (or lack thereof), is revealed by the coarse quality of the 3kHz peak in the noise modulation graph. The wide base and shelf effect are both signs of understandably low electromechanical standards. Wow and flutter performance is commensurately poor, and the relatively high 0.76% flutter doesn't appeal to my ears at all. However, absolute speed at only 0.66% fast is better than a lot of other players in the test.

SOUND QUALITY

The high wow rate is fairly obvious on all but the most synthetic pop, and proves a bit of a musical limitation. But ignore that for a while and you will notice an otherwise relatively painless sound. This is achieved by a very thick cloudy tonal balance, almost as if the bass was boosted and Dolby in use. This is

obviously a deliberate and effective way of making a bearable sound at low cost; a revealing top end at these sort of flutter levels would be beyond the pale.

Despite its tonal shortcomings in many respects the *D6658* does its job quite adequately, providing non-ear-searing background music for everyday life – it doesn't demand attention but lyrics can be made out if you listen.

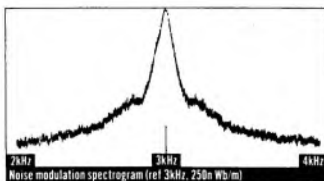
Both FM and AM bands are very much the norm for small plastic boxes. Useable but unspectacular, FM beats tape hands down on sound quality.

CONCLUSIONS

Overall this is an unpretentious little machine with snappy graphics and a basically unfatiguing sound.

TEST RESULTS

Weighted wow & flutter	0.44%
Weighted wow	0.27%
Weighted flutter	0.76%
Speed accuracy	+0.66%
Weight	238g
Price	£29.99



SAISHO PS90R

DIXONS LTD., 18-24 HIGH ST., EDGWARE,

MIDDX HA8 7EG. TEL: 01-952 2345.



Saisho is the 'own label' brand used by Britain's largest electrical retailer, the Dixons chain. The Saisho *PS90R* uses the maximum features approach, with its own built in speakers, an extending aerial, a four-band graphic equaliser and record capable besides.

Unusually it runs off three AA type cells, or will accept the equivalent 4.5 volts DC from an external adaptor (not supplied).

The built-in speakers are tiny mesh covered items that have been stuck on to the back of the machine, and are more suitable as a monitor for finding a radio station than for general use. Not surprisingly the headphones sound better.

LAB REPORT

The noise spectrogram shows a disconcertingly wide base underneath the uneven shoulders and poorly defined 3kHz peak. All factors which indicate rather poor transport control, a bit of an inevitability at the price. Wow and flutter figures on the other hand were better than might have been expected and all fall below the group average, 0.17% wow in particular being quite reasonable in context. Absolute speed was only about half a per cent fast.

SOUND QUALITY

The sound through the built in speakers is very tinny and small, and was not pursued as a viable option. Unfortunately, the headphones aren't a lot better, and I was reminded of the sort of sound piped to the seats on aeroplanes. A great deal of motor noise gets through to the 'phones, which results in listening fatigue and eventually earache.

Music tended to have a limited, 'shut in' feeling, sound-

ing unusually constricted – oboes sounded 'squeaky' and showed up a fair but not unbearable degree of wow (which the average 0.17% test result bears out). Flutter was less obvious, but perhaps contributed to the synthetic element that coloured most of the tapes played on this machine.

As previously mentioned the *PS90R* has a record facility, but this is limited to recording off the radio or using a built in monaural microphone. There is no facility for external line inputs or a separate stereo microphone.

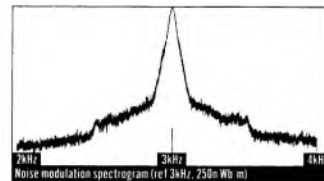
Recordings from the radio were pretty much in line with the general standard encountered so far, but those made with the built in microphone were tarnished by the amount of motor noise picked up off the casing. The FM/MW radio is reasonably sensitive on FM (no doubt aided by the extending aerial), and this proved a strong point of the unit. Medium wave, however, was almost useless.

CONCLUSIONS

If it's features you're into then this model is hard to beat, but in sonic terms it doesn't represent good value and can't be recommended.

TEST RESULTS

Weighted wow & flutter	0.28%
Weighted wow	0.17%
Weighted flutter	0.48%
Speed accuracy	+0.6%
Weight	455g inc
Price	£40



SANYO MGR-77

SANYO MARUBENI (UK) LTD., SANYO HOUSE,

OTTERSPOOL WAY, WATFORD, HERTS.

TEL: (0923) 246363.



The £34.99 *MGR-77* is the least expensive Sanyo in our review group, but still manages to include an FM/AM radio and three-band graphic equaliser in the package. Our model came in red plastic, but judging from the box other colours are also available for the style conscious, though style is not quite the *mot juste* for a rather tacky box designed primarily to be cheap. It certainly looks it, but seemed to function adequately enough nevertheless, which is more than can be said for several other models which had to be replaced before testing could be completed.

LAB REPORT

As seems usual with all but the most expensive players, the standard of fidelity is severely limited by audible wow and flutter. The weighted wow figure of 0.40% is the main problem here; though the ear is less fussy about absolute speed, short term fluctuations of less than half a per cent are painfully obvious. Listening to music with sustained notes becomes particularly unpleasant.

Another less definable problem is a sonic 'grittiness' which is quite fatiguing, even painful. The cause is probably low quality electronics and mechanics, the latter illustrated by the wide and uneven peak on the spectrogram. Another contributor to the 'grainy' effect is flutter, which again is higher than average (for the species) on this player. Absolute speed accuracy showed up as over 2% fast on tests, but this was only audibly noticeable on comparison.

SOUND QUALITY

Tonally the *MGR-77* is on the light side, a characteristic of many personal stereos enhanced

by the particularly low quality headphones supplied with them. In this case a more plausible if less accurate tonal balance could be achieved by enhancing the bass using the graphic equaliser; a sonically better solution would be to buy some better phones. (Those supplied with the Aiwa *FX101* were not bad and got me dancin' to the Housemartins *Happy Hour* track.)

Classical music seemed out of the question because of the obvious and dire wow. Pop and rock tracks didn't seem to suffer so badly, but one's enjoyment here was curtailed by fairly high treble distortion and grain, which seemed to have a cumulative effect on my ears. The longer I listened, the more earache I got, but then I've always been susceptible to this sort of distortion.

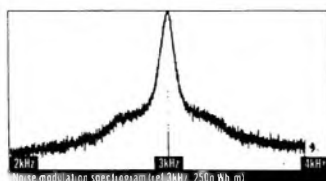
Both the FM and AM wavelengths on the *MGR-77* were quite sensitive, and it was possible to find several stations on a slightly noisy AM band. This may not sound like much but was unusual in the context of the review group as a whole.

CONCLUSIONS

Not a particularly wonderful machine, but one that can be reasonably entertaining with the right material, the *MGR-77* also features a half decent radio.

TEST RESULTS

Weighted wow & flutter	0.50%
Weighted wow	0.40%
Weighted flutter	0.50%
Speed accuracy	+2.07%
Weight	300g
Price	£34.99



SANYO MGR-87

SANYO MARUBENI (UK) LTD., SANYO HOUSE,

OTTERSPOOL WAY, WATFORD, HERTS.

TEL: (0923) 246363.



Styled in navy blue and dark grey, the *MGR-87* is a more macho alternative to the *MGP-600D*. It retails for the same £49.99 price, but lacks the Dolby circuits and metal tape compatibility featured on the *600D*. Very similar black 'in-the-ear' phones are supplied and a three-band graphic, FM/AM radio and auto-reverse are also featured.

Control layout is fairly rational, using a dual function direction and fast forward/reverse slider which always selects the same direction on start up but can be altered thereafter. The radio related switches are quite small and stiff and are a bit uncomfortable to use with one's finger tips; fingernails, proved more satisfactory.

LAB REPORT

Judging from the spectrogram this should be a better player than the *600*, as it has a narrower peak and no distinct shoulders in the gradual ascent of the slope – not perfect but better. The wow and flutter figures also show subtle but distinct improvements, confirmed on the listening test where wow was still in evidence but to a tolerable degree.

Compared to the average figures for the group the *MGR-87* transport was above average on all but wow, which was only .01% worse. Speed accuracy at 2.3% fast was not so hot, but this was not blatantly obvious on the listening tests. Unless you are very familiar with a piece of music or blessed (cursed?) with perfect pitch it may well go unnoticed.

SOUND QUALITY

Partly due to the lack of Dolby noise reduction, but perhaps more importantly because of the earphone type, hiss was rather overbearing on dynamic Dolby

encoded musicassettes. More conventional supra-aural headphones made an improvement in this area, but one lost the edge of clarity that the intra-aurals gave. But then again, this edge could get distinctly 'grainy' on occasions, and the extra warmth was quite welcome.

Wow only became apparent on quite critical material, and for the most part was fairly unintrusive; just steer clear of solo oboe and piano. The sound is not quite up to the exacting standards required for classical music, but this is a quite rhythmic and revealing machine, working well with the Steely Dan tracks I played on it. The slightly 'grainy' flutter-related top end could get a bit wearing on some material, but isn't too bad for the price.

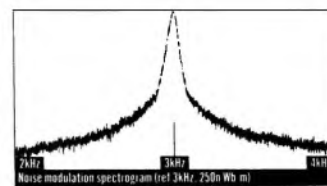
The FM band on the radio was quite receptive and also featured a stereo indicator which was useful. AM was very noisy and hard to enjoy.

CONCLUSIONS

A definite improvement on the similarly priced Sanyo *MGP-600D* and worth considering if tape hiss is not on your list of unbearable things.

TEST RESULTS

Weighted wow & flutter	0.32%
Weighted wow	0.24%
Weighted flutter	0.44%
Speed accuracy	+2.3%
Weight	290g
Price	£49.99



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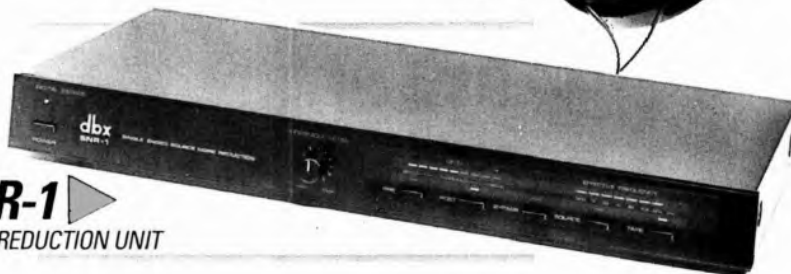
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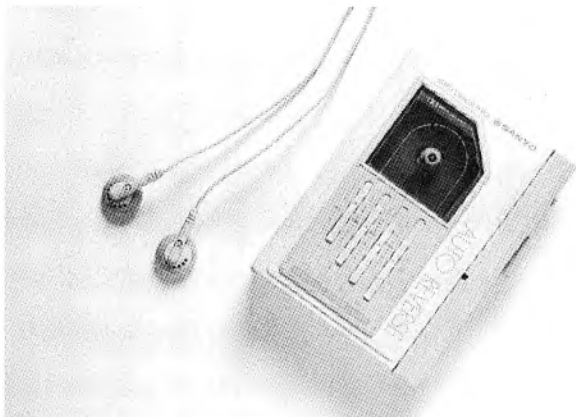


SANYO MGP-600G

SANYO MARUBENI (UK) LTD., SANYO HOUSE,

OTTERSPOOL WAY, WATFORD, HERTS.

TEL: (0923) 246363.



What our black and white picture won't tell you about this particular Sanyo is that it is made of two tone pink and white plastic – a personal stereo for the girlies no less. The \$49.99 *MGP-600D* comes complete with a black case, carrying strap, and pink 'in-the-ear' 'phones that bear a distinct similarity to hearing aids. More importantly, this player features Dolby noise reduction and autoreverse as well as metal tape compatibility.

It is quite well laid out and simple to use, though the aquamarine play and stop buttons are on different sides of the unit. There is even a four-band graphic equaliser on the front of the tape compartment lid, which helps compensate for the rather 'top-forward' earphones. Although these are a fairly good example of the type, if you're not familiar with 'in-the-ear' 'phones it's worth trying them for comfort before choosing a player that comes with them. These ones have a matching case and grey covers that can be removed for cleaning.

LAB REPORT

The spectrogram is about average for the group, the shoulders next to the 3kHz peak representing wow and the slightly ragged and wide peak correlating with the overall poor speed stability. However, wow was audibly pretty low – even unnoticeable with a lot of music. But highish 0.48% flutter was probably partly responsible for the grainy top end that discouraged extended listening.

SOUND QUALITY

The *MGP-600D* sounded quite pleasant with a wide range of material, the midrange proving the most convincing area tonally.

Despite their appearance, the earphones sounded reasonably good, although the top end could have been a bit cleaner. The player suited acoustic guitar music quite well, and I listened to an excellent Al Di Meola track with some pleasure for some time. Things got a bit out of hand as orchestral music started to get busy, and the sound became compressed, thin and generally insubstantial. The Dolby noise reduction was a bit hamfisted, taking away a good chunk of the upper registers with most of the hiss, and leaving a rather lifeless sound.

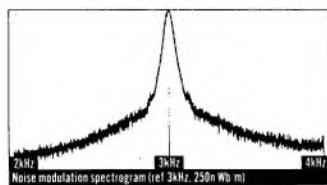
The autoreverse function worked quite well, and a very basic set of batteries played at half volume for nearly five hours before slowing down. As with a lot of these machines the graphic equaliser proved to be a rather unsubtle device, but one that could make slightly rough tapes more bearable if used conservatively.

CONCLUSIONS

Not a bad little machine, but no Best Buy either I'm afraid. If you like the styling and can endure the phones, give it a try.

TEST RESULTS

Weighted wow & flutter	0.38%
Weighted wow	0.25%
Weighted flutter	0.48%
Speed accuracy	1.56%
Weight	270g
Price	£49.99



SANYO JJ-P4

SANYO MARUBENI (UK) LTD., SANYO HOUSE,

OTTERSPOOL WAY, WATFORD, HERTS.

TEL: (0923) 246363.



Sanyo claim the *JJ-P4* is the smallest personal stereo available, and it certainly is very *petite*, virtually the same size as a normal cassette box only just a little thicker. The test unit was finished in white enamel, and conveyed an expensive feel which was enhanced by the very neat volume, mode and transport controls. But of course for £99.99 one expects an improvement on the usual run of the mill.

The replay head and pinch rollers are housed in the cassette compartment lid, leaving all the motorised elements in the main body of the machine – a nice layout that allows easy head cleaning but needs slightly more precise tape insertion than usual. The *JJ-P4* comes with its own rechargeable nickel cadmium battery and mains charging unit, but a single AA battery case can be clipped onto the player, adding an extra seven hours (alkaline battery) playing time to the two and a half offered by the inboard cell.

The earphones are an intra-aural 'in-the-ear' type, with the option of being clipped onto an adjustable headband that facilitates putting on and taking off the 'phones. The *JJ-P4* features Dolby noise reduction, metal tape compatibility, and autoreverse, the latter being effected by an electronic direction change button which works smoothly.

LAB REPORT

Considering the price of the machine the test results weren't particularly spectacular, as a glance at the spectrogram will show. The wide and uneven base of the 3kHz peak is perhaps indicative of the mechanical compromises that must have been unavoidable in making such

a miniature player.

The combined wow and flutter figure of 0.27% is relatively good for the group, but the individual figures are both pretty poor, and wow was audible. Absolute speed was quite good, this being the only Sanyo tested to keep within 1% variation from the standard 4.75cms/second.

SOUND QUALITY

Happily, respectable sound quality helps make up for the *JJ-P4*'s mechanical problems, as it sounds quite accurate tonally. Moreover, it is one of the few players in the test that presents music quite subtly, revealing nuances that most ignored.

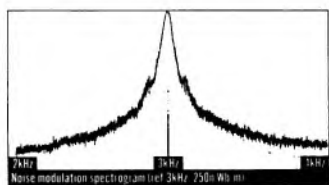
Using Dolby didn't appear to have a great deal of effect on the hiss, which was quite enduring anyway. It just cut out the treble element which gives the impression of sparkle and air, so I tended to leave it off. Without the Dolby burden, the *P4* could sound both lively and give a good impression of ambience.

CONCLUSIONS

The *JJ-P4* is a very attractive and nicely built player that can sound quite energetic with the right material. If wow could be made less audible it would certainly deserve Recommendation. (Try checking a shop sample.)

TEST RESULTS

Weighted wow & flutter	0.27%
Weighted wow	0.26%
Weighted flutter	0.52%
Speed accuracy	+0.60%
Weight	160g inc
Price	£99.99



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SONY WM-34

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES,

MIDDLESEX TW18 4PF. TEL: (0784) 67000.

BEST BUY



Retailing at £39.95, Sony's *WM-34* is a fairly straightforward no-frills machine that is simply and tastefully designed in high tech grey. I think it's the only player in the bunch that usefully reveals the title of the tape it is playing, *ie* it has a window over the top half of the cassette. The only additions to the transport and volume controls are switches for Dolby and metal tape type. No autoreverse, no graphic equaliser and no radio - I have great hopes for this one. Even the headphones are reasonably sized supra-aural models, and are comfortable to boot.

LAB REPORT

However, there's nothing like a mountain range of a spectrogram to give one reservations about a player. This must be the worst one in the group, indicative of a less than wonderful tape transport. The concomitant sonic effect seemed to be a 'phasiness' about the sound and a general lack of subtlety.

The combined wow and flutter figure is more appealing, however, and wow individually is very good - a positive sign. Flutter is about par, which isn't bad for the price, and speed accuracy, like all the Sonys, is very good.

SOUND QUALITY

Listened to using the Jecklin *Float* headphones the *WM-34* had a similar tonal balance to the reference *ProWalkman*, which is no mean feat at a seventh of that player's cost. The 'phones supplied with the player gave a thinner balance, losing the depth and substance of the better transducers. But on rock and less complex classical material it coped pretty well, sounding quite controlled and pleasantly devoid of wow.

The phasiness mentioned ear-

lier was sometimes disconcerting with headphones, but for the most part was not too obvious. Interestingly, tape quality seemed to have a bearing on this effect, and metal tape was less susceptible.

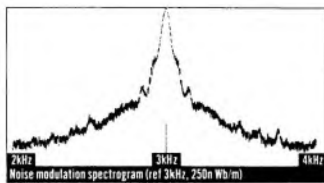
Dolby noise reduction was once again a bit heavyhanded and unnecessarily compressing, only useful with the quietest passages. Musically this genuine *Walkman* had a coherent and energetic character with good stereo separation. The flutter component apparently added a slightly wearing edge in the treble, but not sufficient to induce pain at reasonable levels.

CONCLUSIONS

The *WM-34* offers a realistic selection of features and is perhaps the most musically involving low cost player in the review. It is definitely pushing up the standards, and as such warrants Best Buy rating.

TEST RESULTS

Weighted wow & flutter	0.27%
Weighted wow	0.16%
Weighted flutter	0.56%
Speed accuracy	+0.63%
Weight	215g inc
Price	£39.95



SONY WM-F38

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES,

MIDDLESEX TW18 4PF. TEL: (0784) 67000.

RECOMMENDED



The *Walkman F38* submitted for this test was finished in baby blue plastic with a light grey trim and matching blue headphones. I didn't adore the colour, but the standard of finish and shape of this £69.95 player was quite attractive, and even the headphones were well designed. Going by features alone this would seem to be a *WM-34* with a radio in the lid, but the lab tests and battery positioning suggest otherwise. It features Dolby and metal/chrome tape type switches plus the aforementioned FM/AM radio which has a stylish tuning knob built into the curve of the tape compartment lid. This is one of the few players with a hinged battery compartment, making it difficult to lose the cover inadvertently.

LAB REPORT

Like its less expensive '34 brother, the *F38* produced an unimpressive noise modulation spectrogram. A lot cleaner leading up to the main 3kHz peak, it still displays a good pair of double shoulders, which isn't a good sign.

However, the wow and flutter figures are all reasonably good by personal stereo standards, the impressive 0.13% wow figure being comparable to lesser domestic machines. Absolute speed stability is also remarkable at a mere 0.3% fast, which is only 0.1% worse than the reference.

SOUND QUALITY

The *WM-F38* can sound quite refined and subtle with a good pair of headphones, making it plausible to listen to the most critical classical music. Wow does make itself heard occasionally, but only in tricky situations such as the oboe in the Mozart concerto, although this piece still

sounded very fine. Full orchestras could sound a bit constrained and congested when the action got busy, but not to an unbearable degree. In comparison the light blue headphones sounded expectedly rather lightweight, but remained reasonably revealing and painless. The wow element was undetectable with contemporary music, and the precise speed gave a solid and rockin' feel to many tracks.

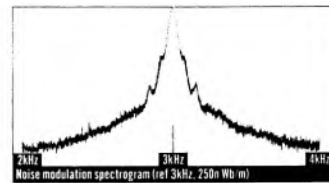
As with many other players, Dolby only served to remove what ambience the 'phones could come up with, and hiss levels were good enough to do without it for the most part. The radio sports an incredibly short (less than one inch) tuning dial, which means stations are fairly close together. Consequently only the bare minimum of FM stations were available. Despite the crude tuning knob it was surprisingly possible to locate several AM stations.

CONCLUSIONS

The Sony *WM-F38* offers worthwhile sonic improvements over the cheaper '34, sounding significantly more refined and subtle. What's more it looks cute, so Recommendation is mandatory.

TEST RESULTS

Weighted wow & flutter	0.23%
Weighted wow	0.13%
Weighted flutter	0.48%
Speed accuracy	+0.3%
Weight	250g inc
Price	£69.95



SONY WM-F63 SPORTS

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES,

MIDDLESEX TW18 4PF. TEL: (0784) 67000.



The *Walkman F63* is a chunky yellow radio/cassette player that is designed for the great outdoors. Unlike the headphones, the player itself is described as 'splash proof', and is not an accessory for sub-aqua activities. The matching yellow and grey 'phones are even more averse to water, making this combo appropriate for only the most confident sail-boarders.

The cassette compartment houses the Dolby, autoreverse mode and tape type switches as well as the battery compartment. The lid is clamped shut by a black hinged locking device that fits over the chunky rubber transport controls. Even the headphone and 3v DC input sockets have grey rubber plugs to keep the detritus out.

This is one of very few players with a truly accessible volume control, though the same can't be said of the rather stiff tuning knob. I guess the styling may not appeal to everyone, but it's easy to see why this particular Walkman has become a major fashion accessory. The folding earphones are the type that face forward in the ear; comfortwise they don't suit everyone, and this is an important factor to check out prior to purchase.

LAB REPORT

The noise modulation spectrogram is reasonably clean except for a peak around the 2.5kHz point. This relatively good result contrasts with the wow and flutter figures which although better than the personal stereo average are worse than those recorded for the cheaper *WM-F38*. The all important wow figure of 0.16% is reasonably healthy though, and audible wow was in keeping with this - audible but not too bad.

Absolute speed control proved fairly good, being less than half a per cent fast.

SOUND QUALITY

The sound quality available from this *Sports Walkman* was seriously marred by the remarkable ability of the 'phones to convey hiss to ones' ears. What's more this didn't greatly improve with the Dolby switched in - in fact the effect upon the hiss seemed to be negligible.

To get a fair idea of the sonic abilities of this machine, an alternative pair of headphones were pressed into action. With the 'phones from the *WM-F38* the picture improved, but not dramatically. Tape hiss is definitely this player's shortcoming.

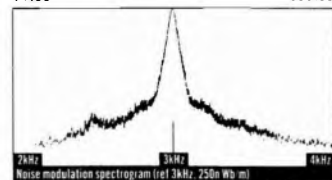
Wow was detectable with critical material, but no problem with the sort of music that is more likely to be played on this sort of machine (he opines presumptuously). With the Housemartins tracks it brought across a lot of the energy and pop that is the trademark of that band.

CONCLUSIONS

If you discard the phones in favour of a more conventional type, this can be a solid sounding player that gets my personal vote if not a formal *Choice* Recommendation.

TEST RESULTS

Weighted wow & flutter	0.26%
Weighted wow	0.16%
Weighted flutter	0.44%
Speed accuracy	+0.46%
Weight	290g inc
Price	£99.95



SONY (WM-D6C) WALKMAN

SONY UK LTD., SONY HOUSE, SOUTH STREET, STAINES,

MIDDLESEX TW18 4PF. TEL: (0784) 67000.

BEST BUY



The Sony *ProWalkman* has acquired a somewhat legendary status in the industry as one of the best cassette recorders around, regardless of type. This in turn has created a very healthy demand which Sony UK have had difficulty in meeting. At the time of writing they didn't have a single unit in stock. The one under review was borrowed from the Editor (under duress), and is at least three or four years old. But it was still an order of magnitude better than the other players, and provided a suitable reference point for the review group as a whole.

It is equipped in much the same manner as a contemporary domestic machine, with Dolby B and C, line in and outputs (3.5mm jack), adjustable record level, and peak level metering and battery condition LEDs which can be switched off. (These latter functions apply to both channels simultaneously.) More unusual features include fine tuning for absolute speed and a microphone input with switchable attenuation. This seems a lot to pack in to a *Walkman*, but the *Pro* is at least twice as large and heavy as many of the other players in the test.

LAB REPORT

The noise modulation spectrogram shows an exceptionally fine 3kHz peak line, which betters any others in this review for resolution and compares favourably with a graph taken from the Nakamichi *Dragon* used to make the test tape. The weighted wow and flutter results are not too shabby either - wow individually is an incredible 0.04%, and the combination of the two doesn't even make 0.1%. Absolute speed wasn't far off either, and probably

could have been negated with adjustment.

SOUND QUALITY

I must admit it makes a change to find a product which inspires enthusiasm in the way that the *Pro* does. It manages to combine lucidity, control and energy, presenting music in a relaxed manner that would not embarrass a half decent turntable.

Had I a superior machine with which to compare it, I may have been able to find some faults, but none were particularly obvious. Observations of a slightly softened attack and poorly defined lower bass could easily be due to weaknesses in the actual cassettes themselves, or of the medium as a whole. Recordings made from vinyl on metal tape sounded a bit harsh in the uppermost registers, which is probably a product of the flutter element - the player's main weakness in the lab test. This effect, however, was less noticeable on Type II tapes, although these lacked the incisiveness of the metal tape.

CONCLUSIONS

An excellent machine by any standards, one that makes the grade as a top flight hi-fi product and is portable to boot. A confirmed Best Buy as a personal or a cassette deck proper.

TEST RESULTS

Weighted wow & flutter	0.07%
Weighted wow	0.04%
Weighted flutter	0.32%
Speed accuracy	+0.2%
Weight	750g inc
Price	£249-289



TOSHIBA KT-4027

TOSHIBA UK LTD., TOSHIBA HOUSE, FRIMLEY ROAD,

FRIMLEY, CAMBERLEY, SURREY GU16 5JJ.

TEL: (0276) 62222.



The Toshiba *KT-4027* is priced at a penny under thirty-five pounds and as such is in the best selling sector of the market from a price point of view. It is fairly typical of low cost players, featuring the usual add-ons like a three-band graphic and FM/AM radio but not much else. Finished in rather tacky dark red plastic with a removable belt clip, it is the stuff that Christmas and Birthday presents are made of.

The radio actually has a stereo indicator light and the sliding volume control is easily adjusted (be it on purpose or by mistake if snagged on your clothes – a point worth remembering if you value your hearing). Opening the tape compartment lid reveals a single capstan and pinch roller and two plastic location pins, which look substantial enough for the job. Otherwise it's an innocuous enough little (well, medium-sized) machine that's easy to use and looks reasonably robust.

LAB REPORT

The noise modulation graph shows a distinct shelf occurring before the main peak, making the area underneath quite large and reflecting the poor quality mechanical components. It's also a visual indication of the audible noise noted in the sound quality section below.

Despite this the wow and flutter figures are quite reasonable for a cheap machine, all being about average for the group. However, audible wow is about average for the group as well. Absolute speed is almost 3% fast, which is up there with the worst of them but not necessarily a serious block to musical enjoyment in itself.

SOUND QUALITY

The music picked up by the head

phones on this machine is quite badly afflicted with wow, to the point where classical music sounds absurd. It is still quite noticeable on rock tracks, but not to the extent that one gives up (well, not often). The treble is blemished by a high pitched buzzing which sounds electronic in nature and is very wearing. This part of the frequency range is rolled off quite early and curtails tape hiss as well as high notes, resulting in rather 'warm' tonal balance.

The headphones are reasonably comfortable supra-aural types that work well with this machine, inasmuch as they have an unrevealing nature which makes the least of the noise being emitted by the player. Better phones just reveal this factor.

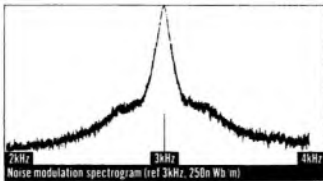
The player has a quite stark nature that can turn to harshness with the wrong material, but could be described as lively under better circumstances. Perhaps frantic is more apt, as the severe speed increase can be quite obvious on familiar material, providing an odd sense of urgency.

CONCLUSIONS

Perhaps not the greatest personal in the test, neither is it the worst, and this could be a poor sample – but I doubt it.

TEST RESULTS

Weighted wow & flutter	0.34%
Weighted wow	0.23%
Weighted flutter	0.50%
Speed accuracy	+2.8%
Weight	255g
Price	£34.99

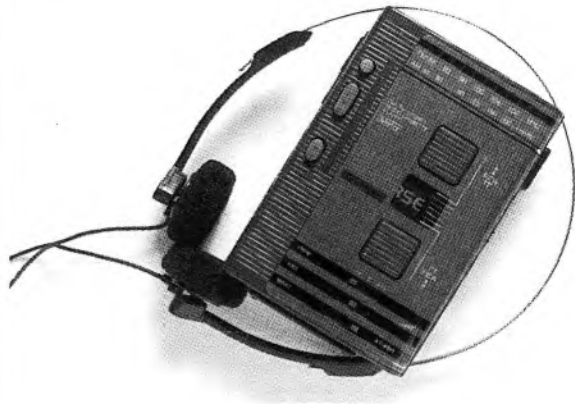


TOSHIBA KT-4047

TOSHIBA UK LTD., TOSHIBA HOUSE, FRIMLEY ROAD,

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The *KT-4047* retails at £60 and features a whole host of gadgets to keep the user entertained. The materials used and the general styling are both pretty naff, such as fluted dark red plastic with buttons over each tape spool centre for fast winding fr'instance. However the latter idea is functionally quite useful with autoreverse decks, as it is often hard to figure out which side of the tape is being played; this player further helps you out with its forward and reverse LEDs.

The various switches to be found along the sides of the *4047* are marked with legends that are moulded in relief out of plastic. As such they are usefully tactile but quite hard to read, but this would become less of a nuisance with familiarisation. It has three modes of autoreverse, Dolby noise reduction, a three-band graphic, and FM/AM radio. The headphones are pretty run of the mill, but are at least made by Toshiba rather than the OEM models that are so common with many cheap players.

LAB REPORT

The noise modulation graph is reasonably smooth in shape although the line itself is a bit rough, which tends to result in reasonable speed control but a lack of refinement to the sound. The weighted wow and flutter figures are all quite healthy (in context), being comfortably better than average. Absolute speed accuracy at only 0.1% fast was the best in the group, which is creditable by any standards, and evidence that this machine must be doing something right.

SOUND QUALITY

This Toshiba seemed to work quite well, not audibly wowing except on very difficult pieces

such as piano. The sound had a crisp if slightly 'frayed' quality that suited the more plush recordings. Orchestral instruments tended to sound a little thin and flat, and tape hiss was also particularly prominent. Dolby didn't seem to discourage this much, instead playing its favourite trick of compressing the life out of the sound.

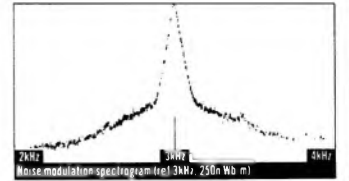
Acoustic guitar showed up quite a nice midrange, and a recording of such music on metal tape sounded very precise, lively and immediate. Tonally the headphones proved to be a limitation as usual, and the *Floats* lent some lower octaves as well as a better notion of three dimensionality to the sound. The radio was more sensitive than usual on both wavelengths, and is a useful second or perhaps first source, given that a half decent broadcast can sound better than virtually any cassette deck.

CONCLUSIONS

Despite its rather tacky appearance the *KT-4047* is a musically competent machine, working ably with most material. Which combined with a realistic price makes Recommendation mandatory.

TEST RESULTS

Weighted wow & flutter	0.25%
Weighted wow	0.17%
Weighted flutter	0.46%
Speed accuracy	0.1%
Weight	265g
Price	£59.99



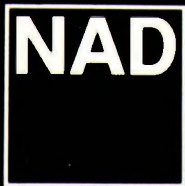
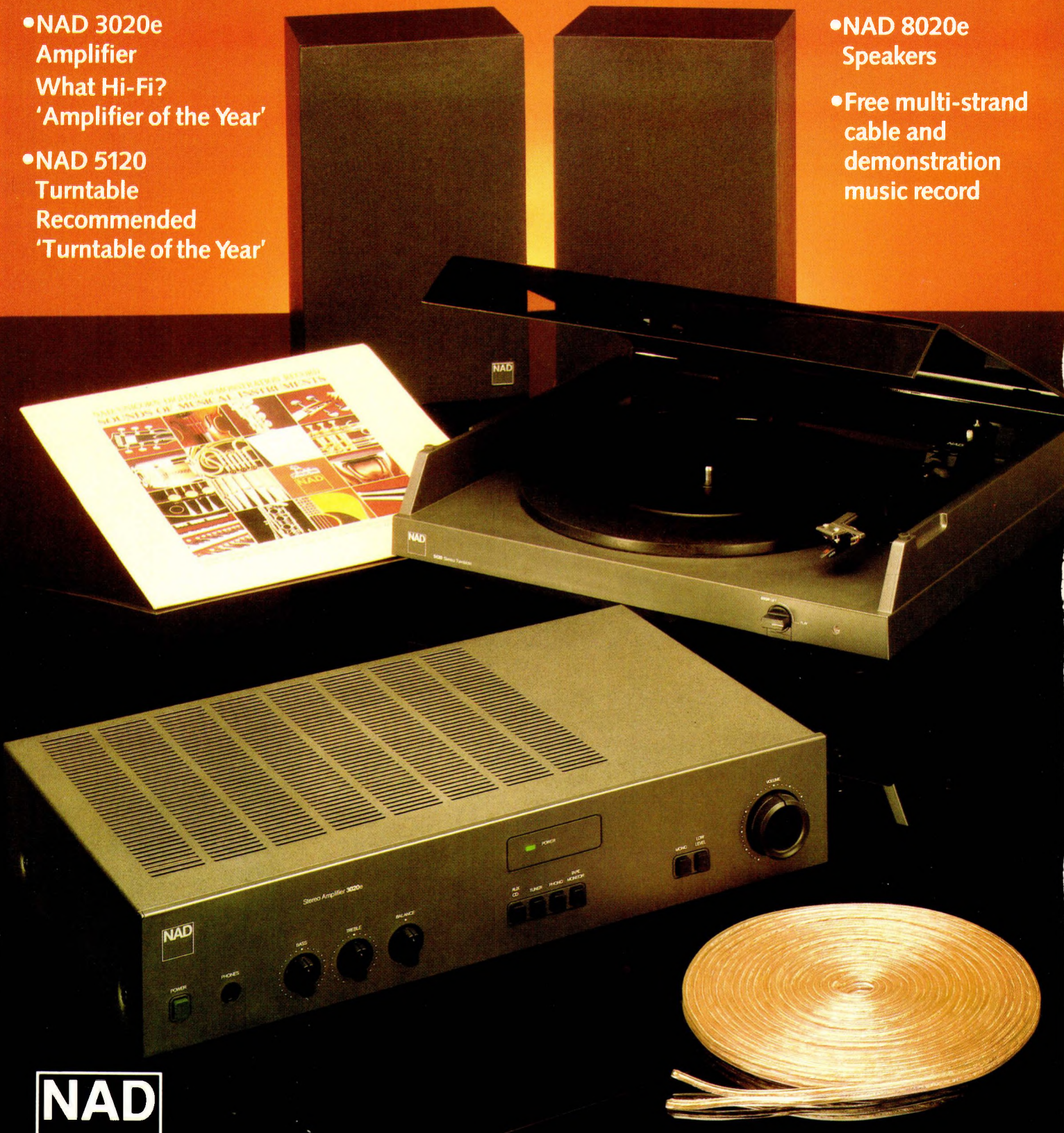
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65 HIGH STREET, BRIDGWATER (0278) 421234



PERSONAL STEREOS: CONCLUSIONS, BEST BUYS AND RECOMMENDATIONS

On the whole these personal stereos turned out to be a more tolerable species than previous experience had led me to expect. Past encounters had inevitably resulted in some form of aural fatigue, but this seems to be a problem endemic with inexpensive machines. From this review experience it would seem that £70 is the price one has to pay for a half decent player. This may seem a lot in the context of £7.99 stocking fillers, but is half what one needs to pay for a reasonable quality domestic mains recorder.

One relevant factor in the superiority of the Sony *ProWalkman* over the competition is probably its 6 volt power supply, which is twice or four times most others. Low operating voltages are almost certainly one of the reasons why wow and flutter were so much in evidence. Even amongst the more expensive players, speed stability turned out to be the key determinant of overall sound quality.

Dolby noise reduction circuits were fitted to virtually all the £50+ units tested - and again with the exception of the *ProWalkman* proved remarkably poor sounding devices, quite possibly for the same low voltage reason. Some applications admittedly removed some of the tape hiss, but the most common effect was the extraction of musical information at around the same frequency. To a machine, Dolby blocked out what air and life the player could extract, and there was no occasion when the hiss was more objectionable than the noise reduction - we should be grateful that it is at least switchable.

The addition of radio tuners to many players is a useful and welcome feature. The sound quality available with reasonable reception outclasses all but the best tape reproductions.

BEST BUYS

Only three models made this grade, which may seem a little harsh, but the overall performance standards were decidedly unimpressive in general audio

terms, and we would be misleading those familiar with our standards by including a few more just for the sake of it.

Sony WM-34 (£39.95)

This was the only sub-£50 personal to offer anything like adequate sound quality. Well suited to pop and rock music, reasonable speed control maintained a solid feel to the sound.

Sony WM-F38 (£69.95)

The *F38* represents a worthwhile improvement on the *34*. It is more fluent and articulate and offers a definite step-up in tonal accuracy.

Sony ProWalkman (WM6DC) (£249-289)

Very much a hi-fi product, the *Pro* with its control, articulation and openness was the only serious hi-fi contender, and can double as a domestic deck beside. Capable of broadcast standard recording, it is hard to criticise for the price, though comparatively bulky and heavy to tote around.

RECOMMENDATIONS

This category includes players that offer generally good value for money.

Toshiba KT-4047 (£59.99)

The *4047* turned out to have the most accurate absolute speed of all - a factor that contributed to its ability to make the most out of a good recording. On other material it could sound a bit brash, but overall it is an agreeable machine that comes close to Best Buy status.

Aiwa HS-J36 (£89.00)

This read/write player proved to be a coherent and highly listenable player when partnered with a good recording. Perhaps a little unsubtle, its strength is the better than average speed stability which lends the required timing to rock tracks.


Aiwa HS-PX101 (£149.99)

Easily the most desirable looking player in the bunch the *PX101* was not a bad performer either. It made other players seem uncertain with its brash confidence, and was only occasionally let down by audible wow.

SELECTED DEALER DIRECTORY


Choosing a good hi-fi dealer is the most vital step in acquiring the system that is right for you. This unique directory gives full information on dealers in your area.

AVON


ABSOLUTE SOUND AND VIDEO, 65 Park St, Clifton, Bristol. (0272) 264975. A&R, Denon, Dual, Linn, Mission, NAD, Quad, Roksan, Rotel, Yamaha, etc. (closed Weds) BADA MEMBER 


PAUL GREEN HI-FI LTD, Kensington Showrooms, London Rd, Bath. (0225) 316197. A&R, Creek, Dual, Heybrook, Linn, Musical Fidelity, Rotel, Systemdek, Wharfedale. Dem facilities available, ring for appointment, car park. Open Tues-Sat, 9-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. BADA MEMBER.

BERKSHIRE

READING HI-FI CENTRE, 4-6 Harris Arcade, Friar St, Reading. (0734) 585463. The best equipment, advice and service from Berkshire's premier Hi-Fi emporium. BADA MEMBER 

BUCKINGHAMSHIRE

AUDIO INSIGHT LTD, 53 Wolverton Rd, Stony Stratford, Milton Keynes. (0908) 561551. A&R, Audiolab, Heybrook, KEF, Linn, Mission Cyrus, Musical Fidelity, Nakamichi, Nitech, Rotel. Dem facilities available. Open Tues-Sat. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept. BADA MEMBER 


AYLESBURY HI FIDELITY, 98 Cambridge St, Aylesbury. (0296) 28790. Dual, Heybrook, Linn arms, Musical Fidelity, Mission, NAD, Nakamichi, Quad, Rotel. 2 Dem rooms available, ring for appointment. Open 10-6 Mon-Fri, 9.30-5.30 Sat. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Amex, Diner, Visa. Service dept. BADA MEMBER 


CAMBRIDGESHIRE

CAMBRIDGE HI FI, 1 Hawthorn Way, Cambridge. (0223) 67773. AR, Mission Cyrus, Monitor Audio, Panasonic, Pioneer, Sony ES, Technics, Thorens, Kenwood, Yamaha. Demonstration facilities. No appointment required. Open 9.30-5.30 Mon-Sat. Free installation. Credit facilities. Up to any amount. Credit cards: Access, Barclaycard. Service dept. available. BADA MEMBER 


STEVE BOXSHALL AUDIO, 41 Victoria Rd, Cambridge. (0223) 68305. Quad, Rotel, Dual, Denon, Krell, Nakamichi, Marantz, Monitor Audio, Tannoy. Demonstration facilities. No appointment required. Open 10.00-6.00, Mon-Sat. Home trial facilities, free installation, credit facilities. Credit up to £3,000. Credit cards: Access, Barclaycard, Service dept.


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ASTON AUDIO, 4 West St, Alderley Edge. (0625) 582704. Wide selection of equipment in N.W. Two-year guarantee. Dem facilities: 3 dem rooms, appointment required. Open 10-6 Tues-Sat. Home trial facilities, free installation. Instant credit up to £1,000. Credit cards: Access, Amex, Diners, Visa. Service dept. BADA MEMBER 

DOUG BRADY HI-FI, Kingsway Studios, Kingsway North, Warrington. (Padgate 0925) 828009. 1986 Sony/Hi-Fi News Best Dealer in N.W. England and Wales. Largest choice of specialist Hi-Fi in N.W. £100-£20K. All credit cards. 3 Dem Rooms. Dem facilities. BADA MEMBER 

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NEW DAWN HI-FI, 1-3 Castle St, Lower Bridge St, Chester. (0244) 24179. Linn, Quad, Technics, National Panasonic, Denon, Rotel, Dual, Meridian, Aiwa, Philips. Dem facilities: 2 dem rooms. Open 9.00-5.30 Mon-Sat, closed Wed. Free installation, instant credit. Credit cards: Access, Visa, Trustcard. BADA MEMBER 

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
BEECHWOOD AUDIO, 6 Market St, Braintree. (0376) 29060. A&R, Ariston, B&W, KEF, Meridian, Musical Fidelity, NAD, Nakamichi, Pink Triangle, Quad, Rotel. Dem facilities 2 single speaker rooms. Open Mon-Sat, 9.30-6.00. Home trial facilities. Free installation, instant credit up to £1,000. Credit cards: Access, Amex, Diners, Visa.

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LYON AUDIO, 16 Peartree Business Centre, Peartree Road, Stanway, Essex CO3 5JN. (0206) 560259. QED, Rogers, Denon, Systemdek, Nad, Monitor, Rotel, Pink Triangle, JBL, J.A. Michell, Exposure. Dem facilities available. Open Mon-Sat 9am-6pm. Home trial facilities, free installation, credit facilities up to £1,000. Credit cards: Access, Visa, Amex, Diners Club, Hi-Fi Markets, Eurocheque. Service dept available.


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ABSOLUTE SOUND AND VIDEO, 40/42 Albion St, Cheltenham (0242) 583960. A - R, Denon, Dual, Linn, Meridian, Mission NAD, Rotel, Technics, Yamaha, etc. (Closed Wed). BADA MEMBER 

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THE AUDIO FILE, 40 Hockerill St, Bishops Cleeve, Herts. (0279) 506576. Linn, Roksan, Rega, Naim, A&R (Camb), Heybrook, Rotel, Denon, Epos, QED. Demonstration facilities, no appointment required. Open 9.30-5.30 Mon-Sat. Home trial facilities. Free installation, credit facilities up to £1,000. Credit cards: Access, Visa, Diners, Amex. Service dept. available.

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
KENT

JOHN MARLEY HI-FI CENTRES, 2 Station Rd West, Canterbury (Canterbury) 69329. Also at Dover - (0304) 207562. B&W, Heybrook, Magnum, M.Y.S.T., Nakamichi, Pink Triangle, Rotel, Sansui, Technics, Quad. Dem facilities available. Open Mon-Sat 9.00-5.30 closed Thurs. Home trial facilities free installation, instant credit up to £1,000. Credit cards: Access, Visa, Creditcharge. Service dept.

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CLEARTONE HI-FI, 235 Blackburn Rd, Bolton (0204) 31423. Best makes, Linn, Creek, NAD, etc. Dem studios. Laser vision and compact disc centre.


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
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BILLY VEE, 248 Lee High Rd, Lewisham, London SE13 5PT. (01) 318 5755/852 1321. Aiwa, A&R, Creek, Dual, KEF, Linn, Heybrook, Quad, Naim, Rega. Dem facilities: 2 single system studios ring for appointment. Open Mon-Sat 10-7, closed Thurs. Home trial facilities, free installation, interest free credit up to £7500. Credit cards: Access, Visa. Service dept. BADA MEMBER 


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COVENT GARDEN RECORDS, 84 Charing Cross Road. (01) 379 7635/7427. Quad, B&W, Meridian, Mission, Yamaha, Sony, Philips, A&R Cambridge, Nakamichi, Rotel. Dem facilities - no appointment required. Open Mon-Sat 10am-7.30pm. Home trial facilities, free installation - to suit the customer. 7.30am-11.30pm weekdays, 9am-9pm weekends. Credit cards: Access, Visa, American Express, Diners Club. Service dept.

DOUG BRADY HI-FI, 18 Monmouth St, London WC2H 9HB. (01) 379 4010. Wide range of top specialist hi-fi from Britain, America and Japan. Dem facilities: 3 Dem rooms. All credit cards. BADA MEMBER 

GRAHAMS HI-FI, 86-88 Pentonville Rd, London N1. (01) 837 4412. FBA Dealer of the year 1985. Linn, Naim, Rega etc. £300-£3,000-£13,000. BADA MEMBER 


H.L. SMITH & Co Ltd, 287-289 Edgware Rd, London W2 1BE. (01) 723 5891. Aiwa, B&W, Denon, Dual, KEF, Ortofon, Panasonic, Sony, Technics, Yamaha. Dem facilities available. Open Mon-Sat 9-5.30, Thurs 9-1, instant credit up to £1,000. Credit cards: Access, Visa, Diners. Service dept.

K.I. LEISURE SOUND, 48 Wigmore Street, London W1. (01) 486 8262/3. Most major brands: 2 dem studios, appointment preferred. Open 10-6 Mon-Sat. Credit cards: Access, Visa. KJ WEST ONE, 26 New Cavendish St, London W1M 7LH. (01) 486 8262. A&R Cambridge, Audio Lab, B&W Audio Res - Krell, Rogers, Gale, Musical Fidelity, Linn, Magnea Pan, Nakamichi. Dem facilities available - appointment required. Open Mon-Sat 10am-6pm. Limited home trial facilities. System Design & Installation. Credit facilities - Credit cards: Visa, Access. Service dept available. BADA MEMBER 

MUSICAL IMAGES, 45 High St, Hounslow, Middlesex. (01) 570 7512. AR, A&R, B&W, Bose, Denon, Dual, Harmon Kardon, Musical Fidelity, Nakamichi, Quad. Single speaker dem room. Open 9.30-6 Mon-Sat. All credit cards.



SUBJECTIVE AUDIO, 12 Park Avenue, Palmers Green, London N13. (01) 886 2650. A&R, Burmester, Krell, Magneplanar, Meridian, Linn, Nakamichi, John Bowers. Dem facilities: 3 single speaker dem rooms, appointment required 10-6 Tues-Fri, 9-5 Sat. Home trial facilities, instant credit up to £1,000. Credit cards: All. Service dept.

TELESONIC Ltd, 92 Tottenham Court Rd, London. (01) 636 8177. A&R, B&O, B&W, Hafler, Luxman, KEF, QED, Quad, Nakamichi, Rogers. Dem facilities available. Open Mon-Fri 9-6, Sat 9.30-4. Home trial facilities, free installation, credit facilities. Credit cards: Access, Amex, Diners, Visa. Service dept.

THE SOUND ORGANISATION Ltd, No 1, Cathedral St, London Bridge, London SE1 9DE. (01) 403 2255/3088. Counterpoint, Denon, Exposure, Koetsu, Linn, Naim, PS Audio, Roksan, Rega, SME and others. Dem facilities available, ring for appointment. Open Tues-Sat, 10-7. Free installation. Credit cards: Access, Visa. Service dept. BADA MEMBER 


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THE MUSIC ROOM, 50 Bridge St. Manchester. (061) 835 1366. Dem room, service dept. Competitive credit and charge card facilities. BADA MEMBER 

MERSEYSIDE

ABOUT SOUND, 116 Bold St, Liverpool L1 4JA. (051) 709 4865. Mordaunt-Short, Musical Fidelity, Myst, Quad, Revox, Sansui, Sugden, Thorens, Walker, Yamaha. Dem facilities, single speaker room. Ring for appointment. Open Tues-Sat 9-5.30. Free installation, instant credit up to £1,000. Credit cards: Access, Diners, Visa. Service dept.

W.A. BRADY & SON, 401 Smithdown Rd, Liverpool. (051) 733 6859. Largest choice of specialist Hi-Fi in N.W. £100-£20K. All credit cards. 3 dem rooms. BADA MEMBER 


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SOUND APPROACH, 161 Unthank Road, Norwich. (0603) 622833. Ariston, AR, Claymore, Castle, Elite Rock, Haybrook, Matra, Musical Fidelity, Revolver, Yamaha. Dem facilities. Open 9-6.30 Mon-Sat. Home trial facilities. Free installation. Credit up to £1,500. Credit cards: Visa, Access, Diners Club. Service dept available.

WEST MIDLANDS

ALTERNATIVE AUDIO Ltd, 93-95 Hobs Moat Rd, Solihull. (021) 742 0254 (sales), 0248 (service). A&R, Audiolab, Denon, KEF, Marantz, Meridian, Mission, M.A., The Source, Philips. Dem facilities available, appointment required. 10-6 Tues-Sat, closed Mon. Home trial facilities, 3 demo rooms, service dept, free installation, instant credit. Credit cards: Access, Visa, Amex.

FIVEWAYS HI-FIDELITY Ltd, 12 Islington Row, Edgbaston, Birmingham. (021) 455 0667. A&R, Denon, Dual, KEF, Meridian, Musical Fidelity, Nakamichi, Philips CD, Quad, Revox, etc. Dem facilities. Single speaker dem room. Open 9.30-6 Tues-Sat. Home trial facilities, free installation, credit facilities. Credit cards: Access, Visa. Service dept.

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
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
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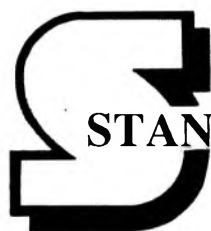
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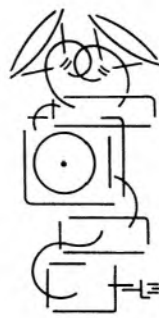
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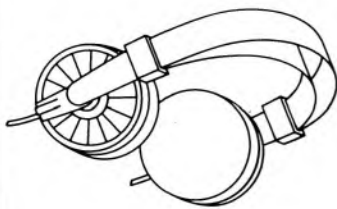
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Pre-packaged one-make systems have been commercially very successful, with advantages like cosmetic consistency, competitive pricing, and (assumed) technical compatibility. However, despite the mass market clout of the consumer electronic giants, the 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 such as valve gear or second-hand items, and unusual even here. Meanwhile the subtle 'fine-tuning' of component matching is almost exclusively the preserve of the specialist, and a major reason for the superior sound of the well chosen separates system. Indeed, the delicate art of 'supercompatibility'



really takes over the major role at a 'super-fi' level, and might be regarded as the key to 'real' hi-fi.

Superficially the pre-packaged system offers better value, purely in terms of the features available for the price. But the buyer who takes the trouble to analyse his or her needs and preferences will often come to the conclusion that step-by-step building of a separates system will provide greater long-term satisfaction, giving flexibility for future upgrading if so desired.

A QUESTION OF PRIORITIES

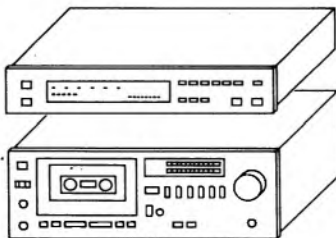
The key advantage of separates is

the opportunity to choose one's own preferences as priorities. Taking the trouble to try and establish these, leads most people to give up, assuming that they don't know enough even to start. But the process needn't be that difficult.

Begin by establishing whether you like to choose your own music, or have it chosen by someone else. This helps sort out what priority should be given to radio, but bear in mind that the best radio music is live radio music, which is very rare and often quite esoteric; when radio is merely an alternative source of pre-recorded material, the results will inevitably be inferior to those obtainable directly from the same source in the home, given a reasonably decent 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 radio tuner when funds permit.

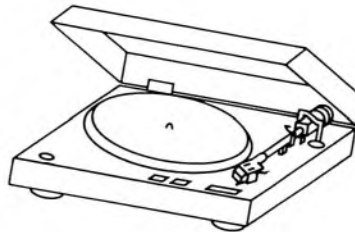
There will always be controversy over the relative qualities of LP, CD and cassette, with earnest protagonists often trying to advance their prejudices by rubbishing rivals. LP is still the choice for ultimate sound quality – particularly for those prepared to



spend a substantial sum on a good quality turntable system. Furthermore the vinyl repertoire is still the cheapest, largest and most varied, especially if one acknowledges a secondhand market extending back 30 years. However, LPs remain tied to the home, are prey to warps and surface noise even when purchased new, and do not survive

rigorous physical abuse at all happily. Though bulky and heavy to store, the 12-inch cover has been turned to good use for artwork and liner notes, creating a pride of ownership somehow un-matched by CD or musicassette.

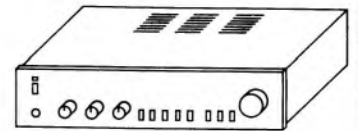
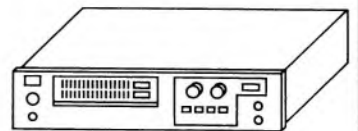
Cassette has never really challenged vinyl's potentially superior quality, but it is a multiple role format, offering 'go anywhere' flexibility, a uniquely useful recording capability, plus a broad catalogue of pre-recorded musicassette material. Although there are several potential rivals for recording from radio or pirating copyright material, the cassette still wins on convenience and compactness, though the sudden rise in popularity of double mechanism 'dubbing' decks remains mysterious. 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, while any such home recording is inevitably poorer than the original.



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. 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 new 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. Player prices are still on the high side (typically £200), but dropping. However, disc prices are still nearly twice those of LP and cassette, (they're expected to drop in the New Year) which is a significant disincentive for the music lover who is effectively starting from scratch. A major influence over signal source priority will be how many LPs, tapes and CDs a person already owns. To replace even the key items of a large LP collection with CDs will cost a great deal of money.

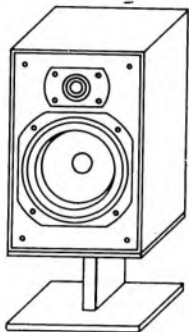


A MATTER OF PRECEDENCE

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).

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. Recently, 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. And such an argument applies just as strongly to those who wish to



record their LP records on to cassette, for convenience and use elsewhere.

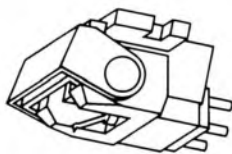
MAXIMISING POTENTIALS

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. Just lining the components up along a shelf or sideboard is a recipe for mediocrity, however much has been spent on the individual components themselves.

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. Though it is not really practical to move the walls around (and stud type walls behave differently from brick ones in any case), the odd strategically

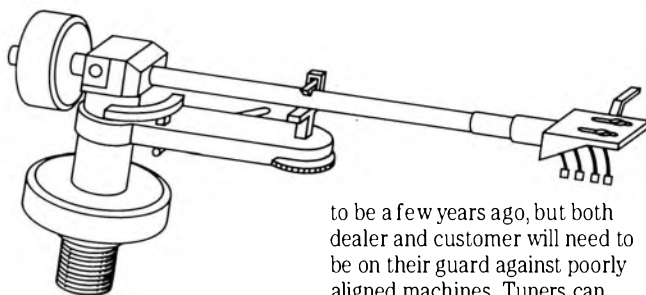
placed wall-hanging, say above a fireplace, can work wonders in removing an unpleasant 'flutter echo' effect, while a decent carpet is almost mandatory. 'Live' rooms are usually those that are sparsely furnished with hard wall coverings, so the overall live/dead acoustic balance can often be modified according to the furniture (or even the number of people) present.

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 will be designed to operate close to a rear wall, others a metre or so out into the room, but all loudspeakers seem to benefit from being closely



mechanically coupled *via* proper stands to the floor.

There is some debate about the best form of fixing, and in some instances the floor resonances themselves can become excited, particularly if a single concrete casting, and this may cause undesirable side-effects. 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, and seem to give the best rigidity. Some speakers will work best with another set of spikes operating upwards into the loudspeaker itself, but small pieces of Blu-tack are a popular alternative. 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, but polished wooden floors do present a problem here,



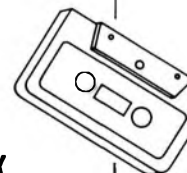
and hard plastic studs may be the only satisfactory solution.

Most decent quality turntables are fairly immune from 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. Turntables are usually susceptible to footfall shock, so one solution may be to use a wall bracket, but these do not sound as good as a floorstanding table as a rule. It may sound unlikely, but amplifiers and CD players (and presumably cassette decks too) can also benefit sonically from carefully stand- or bracket-mounting in a high quality system.

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.

Getting the best from a cassette deck is usually a question of making sure first of all that your deck does a decent job of replaying a good quality music cassette, and then finding out which tapes in the different price groupings give the best record/replay performance. The most common problem with cassette decks is in their alignment: matters are better than they used

to be a few years ago, but both dealer and customer will need to be on their guard against poorly aligned machines. Tuners can occasionally suffer similar problems, though this is even more unusual; most radio difficulties are likely to come from an inadequate or inappropriate aerial, after scrimping on the less glamorous part of the budget. CD players have fewer consistency problems than analogue systems, though it is mildly ironic that they too seem to derive some sonic benefit from spiked stands or tables in a high quality system, and a poorly aligned machine may give poor disc tracking.



THE FINAL LINK

The key to getting the best results from a separate system lies in finding an experienced and skilled dealer in the first place. One who takes the trouble to find out what you really want and then demonstrate some likely alternatives, without trying to cram his own particular prejudices down your throat. To some extent the customer's task must be to discover for himself whether the dealer in question is competent or not. Membership of trade organisations like BADA can be a worthwhile pointer to a degree of professionalism, but the bottom line is whether the dealer in question can create a good sound in his own shop. If he can't, there is precious little chance of him doing so in your home. The best dealers should lay on demonstrations so you can hear the differences between components for yourself, and hear the sort of improvements which can be had at different price strata. You can then establish the sort of performance you are prepared to accept within whatever budgetary constraints you have set.

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THE SPECIALISTS

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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 former 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 £220	Good Good	This genuine high fidelity product offers an impressive package at a competitive price	Subchassis, manual, 13.5g	BB	48
Akai APA201 £80	Poor Average—	It 'lived down' to our expectations sounding 'dead' and 'smeared', with little depth and poor bass	Solid, auto return, direct drive, 5g P-mount		48
Alphason Sonata/HR-100S-MCS £695/£359	Excellent Very Good	Highly capable audiophile system with real resolution and control. Bass is powerful and dynamic ability unbridled	Manual, subchassis, belt drive, 10g	R	55
Ariston Q-Deck £140	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	55
Ariston RD60 £219	Good Good	With the Enigma arm, this balanced and communicative turntable falls only slightly short of the RD90 on sound quality	Manual, belt drive, subchassis, 11.5g	BB	48
Ariston RD40 Q/Enigma £388	Average+ Good	Worth considering for stylish appearance and decent performance, but undermined by RD60 in value for money terms	Man/electronic, belt drive, subchassis, 11.5g		48
Bang and Olufsen TX2 £288	Average+ Average+	Fully automatic, it can interface to B&O's remote control system, is attractively styled and even sounds respectable!	Automatic, belt drive, subchassis, 6g (B&O carts. only)		48 (Summary)
Dual CS503-1 £125	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 CS5000 £200	Average Average+	The rare 78 facility may give grandma's collection a new lease of life but the player did not merit recommendation on price vs sound	Electronic, belt drive, subchassis, 10g		48
Heybrook TT2 turntable & arm £279/£249	Average Good+	A gradual process of informed evolution and a sensibly designed arm combine to make this a good sounding middle of the road package. Well supported by dealers	Manual subchassis motor with arm, belt drive, 14g	R	55
Linn Axis £345	Good+ Good+	Setting new performance-for-price standards this cleverly engineered and competent deck has many of the qualities of the Sondek LP12	Electronic, belt drive, semi subchassis, 13g	BB	48/Coil
Linn Sondek/Ittok (Troika) £471/£399 (£625)	Excellent Excellent	Superb sound – the best LP12 combination yet. The Troika gives the system real solidity and strength, stretching the deck and arm qualities to the full	Manual subchassis player, belt drive, 14g	R	55
Logic Tempo/Datum II £240	Good Good+	The general character is lively and exciting, if a little full, with solid, clear open midband, and good stereo staging	Manual/electronic, decoupled plinth, 15g	BB	48
Lux PD290 £167	Average Average	For the non-critical user who likes Lux styling and who requires a basic turntable	Semi automatic, direct drive, 10g		40
Manticore Mantra £300/£330 (Arm)	Good+ Good+	Fitted with a Rega RB250 arm variant and AT95E cartridge the Mantra fared very well indeed with a fine midrange and good focus	Subchassis, 12g, manual	BB	48/Coil
Mission 775LCT £200	Average+ Average+	Gives a tidy, coherent and well-integrated sound; a punchy performer if a bit bass light	Solid plinth, manual, 12g		40
NAD 5120 £90	Average Average—	Offering near hi-fi quality on a suspended sub-chassis deck fitted with an Ortofon OM10 cartridge can't be bad at this price	Semi-automatic, subchassis, 9g	BB	48
Oak/Moth £175	Average— Average—	Despite the excellent Moth tonearm, motor vibration on the Oak makes for a sonically poor performer	Solid, manual, 12g		48
Omega Point Silver/Black £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
Rega Planar 2 £135	Average+ Good	A remarkable product at the price, surprisingly articulate and confident	Integrated turntable, manual, 11.5g	BB	48
Rega Planar 3 £188	Good Good	A long time leader in its price category, the '3 (with its excellent RB300 arm) sounded nicely 'musical' in a balanced and coherent manner	Integrated turntable, manual, 11.5g	BB	48
Revox B291 £629	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
Rotel RP-830 £160	Average Average	Reasonable sound, but nothing to get excited about. Bass quality not well integrated, but control OK; mid/top are fine	Manual, integrated, belt drive, solid, inc cartridge	R	55
Source/Odyssey RP1 From £1,884	Very Good	Mixed. The turntable has tremendous power and authority, but as tested suffered pitch imprecision. The arm is rather ill controlled and lacks resolution and focus	Manual, belt drive, subchassis, motor, onboard PSU, 15g		55
Systemdek II £199	Good+ Good	Rating above average for its price the II sounded open and clear, if a bit soft in the bass	Manual/electronic, belt drive, subchassis, 15g	BB	48
Systemdek IIX £199	Good+ Good	The more conventional appearance of the IIX has made it popular, performing competently, but essentially sounding similar to the II	Manual/electronic, subchassis, 15g	BB	48
Technics SLBD-22 £90	Average— Average—	Not bad for the price and a great improvement on the L20, it performs reasonably when not stretched	Semi automatic, solid plinth, electronic, 6g P-mount	R	48
Technics SL-DD33 £110	Average Average	As with the DD33 though better value	Automatic, direct drive, solid plinth, 7.5g, P-mount	BB	48
Technics SL-L20 £115	Poor Average—	A rather lightweight parallel tracker achieving a poor overall rating, with little to recommend it unless you dig facilities	Electronic, solid plinth, 5g, P-mount		48
Technics SL-QD33 £140	Average Average	The quartz speed controlled version of the DD is short on sound quality but not features. But it did have fair focus and some depth	Automatic, Quartz, direct drive, solid plinth, 7.5g, P-mount	R	48
Thorens TD280 £159	Average Average	Not impressive in the context of other Thorens models. The sound was considered lively if somewhat coarse and brash	Electronic, solid plinth, 12.5g		48
Thorens TD166II £179	Good Good	Old turntables never die, this revived 166 yet again takes its place near the top of its class	Auto lift, subchassis, 7g	BB	48

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

DIRECTORY

INTEGRATED TURNTABLES

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Thorens TD316 £219	Good Good	A competent, well built if not dynamic sounding machine, ably holding its own in its price category	Electronic, subchassis, 4.5g	R	48
Thorens TD320 £319	Good+ Good	The top of the range and a solid performer providing a stable focused sound, and not critical of siting	Electronic, subchassis, 7g (available without arm)	R	48

MOTOR UNITS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Ariston RD90 Superior £900	Good+ Good	Good but slightly damped sound quality, with powerful and stable bass. The pro quo is a certain lack of pace, energy and resolution	Belt drive, subchassis, electronic		55
Audio Labor Konstant £2,560	Good+ + Very Good	The space-station-like solid alloy frame needs a substantial shelf, but absolute stability renders a confident, neutral sound	Belt drive, subchassis	R	48/Coil
Elite Rock £350	Good Good	Tight, tidy sounding player which works with a wide variety of (non-tangential) arms, giving almost CD like precision and clarity. Good bass depth, but dry balance	Manual, belt drive, solid, arm damping, various optional extras	R	55
Goldmund Studio £2,350	Very Good Excellent	A reference point for high end audio, only exceeded by the even more extravagant Reference. Currently being reworked into a more competitive (!) package	Electronic, direct drive, solid subchassis	R	Coil
Logic Gemini £700	Good Average+	Innovative twin-motor design but insufficiently developed. Rates good overall but sounds a bit slow and lacking authority	Subchassis, electronic		48
Michell Synchro £235	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	55
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
Pink Triangle PT T00 £539	Very Good Very Good	A substantial improvement on its predecessor, the T00's new outboard power supply and motor gave a neutral sound with fine depth and detail	Electronic, subchassis	R	48/Coil
Roksan Xerxes £595	Excellent Excellent	This unique design cuts a swathe through the conventions of turntable design, providing superb resolution and stereo. Setting up is critical, and for experts only	Manual, belt drive, solid/decoupled	R	55
SEE Revolver £127	Average Average	Nicely balanced, but unimpressive timing and lightweight bass made this deck rather average for the price. Manufacturer has since made several changes, but not re-submitted for review	Manual, belt drive, solid plinth		48
Systemdek IV £448	Good+ Good+	Clarity and definition in the midrange and treble were outstanding. It was better for firm support; less happy on floor tables	Electronic, belt drive subchassis	R	43
Thorens TD160S Mk IV £225	Average Average+	Good value suspended sub-chassis turntable which doesn't need specialist setting up, and which performs consistently and well. Bass is a little over-warm	Manual, belt drive, subchassis motor unit	R	55
Thorens TD521 £625	Average Average+	Nice product. Unexciting, rather undynamic and insubstantial sound quality, but facilities compensate	Manual, belt, suspended motor unit, 78rpm, pitch control, 12" arm/16" records		55

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MAS	VALUE	BACK ISSUE FULL REVIEW
Airtangent £1,698	Very Good Very Good	This linear tracking air-bearing tonearm delivers the goods despite its extravagant price	7.5g (vert)	R	48/Coil
Alphason Opal £110	Good Average	This is a straightforward adequate sounding low cost arm, priced just above where it rightly belongs	10g		55
Alphason Delta £165	Good Average+	A highly competent design from Alphason gives good sound quality but with slight blurring and treble fizz	16g	R	48
Alphason Xenon £210	Good Good+	A trimmed down HR100S, the Xenon has inferior bearings and a simpler finish, but sounds crisp and coherent. Fits any Linn cutout	12.75g	R	55
Alphason HR100S £395	Good+ + Very Good	This S-shaped arm sounds smooth, but nevertheless reproduces transients with fine attack	10g	R	48/Coil
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 AT1120 £132	Good Average+	This low effective mass (5g) arm suits fairly high compliance MM cartridges; gives pleasant tonal balance with good stereo imagery	5g		35
Decca International £49	Average+ Average+	This uni-pivot design gives a rather rich tonal balance and some bass muddling. Could be good with Decca cartridges, but not well built	12g		48/Summary
Eminent Technology £960	Good+ Good+ +	One of the best sounding tonearms around, the linear tracking Eminent delivers impressive stereo imagery, focus and transparent sound	9g (vertical)	R	48/Coil
Goldmund T3F arm £3850	Excellent Excellent	This complex parallel tracker created an "ear-opening" experience when tested with a (since updated) Goldmund Studio turntable	16.5g	R	Coil 2
Grace G707 £299	Good Good+	This venerable is still capable, if not competitive with modern alternatives	7g		48
Helius Orion 2 £490	Very Good Very Good	Very expensive but with a performance that merits recommendation	12g	R	48
Kusma £349	Very Good Very Good	A classic performance: solid and dynamic with exceptional bass weight and speed, if a little 'untidy'	14.5g	R	48/Coil
Linn LV Plus £129	Good+ Good	The fixed headshell provides an improvement over the LVX resulting in better clarity, detail and punch	13g	BB	48
Linn Ittok LVII £399	Very Good Very Good	Suitable for many turntables this top-quality arm performs best with the LP12, the combination exceeding the sum of both parts	13.5g	R	48/Coil
Logic Datum 2 £230	Very Good Good+ +	Rated sonically very good with fine depth focus and transparency, good air and life, albeit slightly 'untidy'	15g	R	48/Coil
Mission Mechanic £600	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 £65	Good Good+	The ultimate budget arm? Refined, detailed, sweet and natural – performance improves in line with the rest of the system	12g	BB	55
Rega RB300 £90	Good+ + Good+ +	Despite its modest price this sets exceptional performance standards and could be used on a number of high-quality turntables	10-11g	BB	48/Coil
SME 3009 Series IIIS £156	Good Average+	A simplified less flexible (as regards adjustment) Series III with a similarly 'soft' sonic character	5g		48

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 60

DIRECTORY

TONEARMS

NAME PRICE	LAB SOUND	COMMENTS	ARM EFF. MASS	VALUE	BACK ISSUE FULL REVIEW
SME 3009 Series III £216	Good Average+	Comprehensively adjustable and very well made, suited to MM and high compliance MC cartridges	5g		48
SME 3009R £272	Average+ Average+	A higher mass version of the Series III designed for low compliance MC cartridges	12g		48
SME Series IV £675	Excellent Very Good	Superb engineering and finish with a finely balanced sound giving impressive stereo focus and low coloration	10.5g	R	55
SME Series V £1138	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	48/Coil
Souther Tri-Quartz £850	Average Good	A unique parallel tracking arm that makes up for what it lacks sonically in its unusual appearance	3-4g		48
Well Tempered Arm £545	Good++ Good++	The overall performance of this arm "grows" on the listener, justifying the possible mounting complications and radical styling	6.8g	R	48/Coil

CARTRIDGES

Very much the 'slave' of turntable and tonearm, and to some extent undetermined 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 AMP MATCHING	VALUE	BACK ISSUE FULL REVIEW
A&R C77 £20	Average+ Average+	A sensible moving magnet package with good bounce at a competitive price	6-16g Normal	BB	48
A&R P77Mg £47.50	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	R	48
A&R E77Mg £57.50	Average Average	Our sample had a disappointing stylus, but gave a coherent, rich and laid back sound, with good 'scale'	3-8g Normal	R	48
ADC TRX1 £49.90	Average Average	Sounding bright and "tinkly" but with a rich bass this model may endear itself to those who like canaries and gongs. Now quite competitively priced	6-15g Normal		38
ADC TRX II £69.60	Average Average+	Comments like "fiercely exciting" treble and "plummy" bass made this cartridge seem overpriced, though price reductions now make it more competitive	6-15g Normal		38 (Summary)
Audionote 102VDH £795	Good Very Good	One of the best, giving "an extraordinarily relaxing midrange clarity". But it picked up a bit of surface noise and dust and needs a transformer	8-18g Very low (transformer)		43
Audioquest MC5 £200	Average Average	Offers high-output benefits but the drooping frequency response and severe VTA error preclude recommendation	10-20g Normal		54
Audioquest 404BL £299	Average Average	Lateral stereo imaging is thwarted by huge VTA error and the meagre tracking margins do little to help. Sound quality is not competitive	8-20g Low		54
Audio Technica AT 105 £13.95	Average Average	Tight budget people may enjoy this cartridge whose "overall performance was very good for the price"	6-16g Normal		43
Audio Technica AT95E £14.95	Average- Average	Clear, dynamic if richly balanced, the magnetic '95E is a definite Best Buy	8-14g Normal	BB	48
Audio Technica AT 115E £27.95	Average Average	Clear and detailed sound quality although a bit on the "heavy" side. Sonically lagged the cheaper 110E!	5-16g Normal		43
Audio Technica AT3200XEI £42.95	Average+ Average	This high output MC sounds better than it looks, with a decent 'laid back' sound quality	6-18g Normal	R	43
Audio Technica ATF30CC £70	Good Good	Slight generator asymmetry but low overall distortion and broad arm matching, plus a lively balanced sound	8-18g Low	BB	54
Audio Technica AT 140ML £99.95	Average Average	Pricy product this. Prefers low-medium mass arms and low capacitance loading, and is sonically unremarkable	6-12g Normal		43
Audio Technica ATF50CC £100	Average+ Good	Decent output, good channel balance and a thoroughly refined sound sets the standard at £100	9-20g Low	BB	54
Audio Technica AT33ML £238.95	Average+ Good	A little expensive but technically competent, and sonically pretty good; low output MC with rather garish gilt finish	6-16g Low		43
Audio Technica ATOC7 £245	Good+ Good+	Technically and subjectively this cartridge represents a new dawn for AT, in the twilight of analogue audio	6-13g Low	R	54
Azden YM10VE £12.50	Average Average-	A good tracker. Sounds rather bunched-up but not totally incoherent – for very basic systems only	5-15g Normal		54
Azden GM1E £30	Average- Average-	Of academic interest only, this high o/p mc is seriously flawed in sonic terms	8-18g Low/normal		54
Azden GMP5L £99	Average+ Average+	Although no P-mount system will do this cartridge justice, it can still be enjoyed in its universal mode. The subtle balance may prove irresistible to some	4-10g Low	R	54
B&O MMC5 £21	Average+ Average	Cheapest in the family – smooth treble and good focus, but the bass was left in the wings	5-15g Normal		38 (Summary)
B&O MMC4 £33	Good Average+	Solid and well balanced in the midrange, the '4 lacks bass impact	5-15g Normal		48
B&O MMC3 £50	Good Average	Slightly "laid back" sound quality but a good performer for the price. Best suited to B&O equipment	5-15g Normal		48
B&O MMC2 £75	Good Average+	Only a modest improvement on its cheaper brothers (and sisters)	5-15g Normal		48
B&O MMC1 £97	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		48
Cello Chorale £799	Good Very Good	Looking like a piece of NASA gadgetry the Chorale's transparent treble delicacy was without equal. A serious audiophile choice	4-10g Low o/p	R	48/Coil
Clear Audio Gamma £285	Average Average+	Brimming over with enthusiasm, the unusual-looking Gamma is more than an audio oddity, but it lacks a little stability at times	4-11g Low		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	R	54

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

The Music Room

NEWSLETTER

Vol 3 No 10 - March 1988

The world is full of products made down to a price. To our customers, music and Hi-Fi are worth sacrificing other purchases, and in the long-term accomplish more pleasure as well as economy.

In the amplifier world, Audio Research reigns sonically supreme, and the SP-9 Pre-Amp at £1,695 will make 1988 memorable for many fortunate people. Now we are proud to announce the forthcoming D-125, a matching power amplifier to be released later this year: so start saving now! If you can't wait to bring Audio Research into your life, here is a bargain: we have a part-exchanged SP-8 at £995 and a D-80II at £1,250; or £2,195 the pair, both items guaranteed for 12 months under the new Approved Used Equipment Warranty Scheme.

The advanced use of hybrid design has also been employed with special merit by Counterpoint from California, and The Music Room stock the SA7 Mk. II Pre-Amp (£745) and the SA-12 (£1,250) and SA-20 (£2,350). Due to the favourable dollar rate, we are able to promote our American high-end at 15% below list during February only; further arrangements will depend on events, so ring for details. This promotion will make Magneplanar loudspeakers very attractive, especially the SMGA and the new 2.5, and we have in our sale one pair of MG3a's at only £2,000, carriage and insurance paid! Local customers should see our exclusive Magneplanar feet which improve both sound and appearance for only £99 per pair.

Two further panel loudspeaker bargains in the greatest sale we have ever held is a pair of Apogee Duettas at £1,700 per pair, used but perfect, boxed (owner moving to a small flat). We have a Krell KSA-50 in the sale, ex-dem at £2,140 (a saving of £400) and its matching Pre-amp the as yet underrated PAM-5 at only £1,189 a saving also of £400. And we have for only £450 a second-hand pair of Accoustat Model-X in white

(passive version, requiring power amplifier).

The ideal amplifiers for Apogee loudspeakers are Krell and more recently Meitner. The latter are much more economic and compact, but a short audition (or a copy of the rave reviews from America) will soon convince you that Meitners Make Sense. For example, with the currency discount of 15% the PA-6 Pre-Amp costs only £1,440 (RRP £1,695) and the 100W monoblocks only £1,610.75 (RRP £1,895). These prices include vat, carriage UK and of course our full two year guarantee. Send for literature and our Information Sheet No. 10. The STR-50, the stereo 50 watt power amplifier, is reduced in February from £970 to an incredible £825 so what are you waiting for?

Bargain hunters at our shops will also spot Beard - the best of British valves, and Concordant Audio. We have spoken before of the amazing sonic quality and advanced simplicity of this cool-running four-valved pre-amp with separate (solid-state) power supply: all for only £799. Save £150 on two (part-exchanged back for an SP-9 and an SP-11) but be quick or you'll be too late.

In conclusion, the ABC of valves is quite simple: Audio Research, Beard and Concordant/Counterpoint. D is for dunce, delay and digitally chopped music.

ANALOGUE

The market for LP records and turntables has suffered very little from CD, and both markets had stabilised alongside each other before the end of last year. Again, both analogue and CD products presented buyers with high quality reasons to invest their hard-earned cash and the Canadian Oracle Delphi Mk. 3, with or without the Air-Tangent tonearm and Koetsu or Kiseki pick-up cartridge is aesthetically and sonically stunning. Lend us an ear, and consider the optional Sicomin mat, also from Absolute Sounds.

We also stock and recommend

the pick of the crop from Michell, the Gyrodek a bargain at £595 and the amazing Alphason Sonata, with or without its own HR-100 tonearm. At mid-price, the Roksan Xerxes with its latest super bearing fully deserves all the status this young and dedicated company has already achieved. For economy try it with a Rega arm, or for definitive status the SME IV or V will cost £675 or £1,138 but last for life.

So will your records, if you use LAST, and the good news is that it is available again in the UK. If you are serious about your records, you need it. There are many copies of LAST but LAST was first! Formula One is the Power Record Cleaner, which is applied only once per LP to remove mold-release-agent and other contamination to which dirt adheres. Thanks to the unique LAST hand applicator, the cost, noise and time taken by record-cleaning machines is no longer necessary. Formula Two should then be applied, again only once (labels supplied): this is a preservative which fills crevices and pitholes and strengthens and lubricates the groove surface (around ten molecules deep - Last never leaves a deposit). Formula Five is the famed Stylast which lubricates the stylus and extends its life up to ten times the untreated norm. You can hear that something amazing is taking place, if you simply listen to an untreated record, then again either with Stylast alone, or better, with Formulae 1 and 2 and I have seen the looks of amazement in peoples' faces. For the sonic improvement alone, LAST is truly value for money; but the extension of stylus and record life is also worth it alone. LAST is for anyone who is serious about sound, and new formulae have now been developed by the LAST Factory for the other media - tape and CD.

COMPACT DISC

From Cambridge Audio, the amazing three-box CD-1 is on demonstration, but such is its quality that

even at £1,500 it is still subject to a waiting list. We are pleased to announce its successor: so watch this space but if you can't wait, the CD-2 with its amazing 16X oversampling and musical abilities plus a price tag of only £599 makes it an obvious investment: £30 off in our sale, and ex-stock at the time of writing! Keep up the good work Mr. Curtis. The C75/P75 Pre- and Power amp costing £575 per pair are also something of a bargain. Compare them with the Audiolab and Musical Fidelity and enjoy our excellent coffee. Now for de-luxe CD players at affordable prices, how about a Nakamichi OMS-1E for £399? Compare it with the Denon, Philips and Yamaha models (in alphabetical order).

LOUDSPEAKERS

This newsletter began with the theme of no-compromise products. Three loudspeakers of impeccable quality in small bulk are the £1,195 Sonus Faber from Italy, the £3,000 Ensemble PA1 Reference from Switzerland (see Hi-Fi News April 1988) and the recently reviewed WATTs from USA costing £5,500. These loudspeakers (the finest headphones on the planet, according to Ken Kessler) only work with the highest grade of ancillary equipment, but they are capable of stunning! In addition to the special opportunities in loudspeakers at the start of this Letter, we have a Chairman's Infinity RS lb's for £3,750 (as he has to keep up with the Pearsons) and a pair of ex-dem Dark Walnut Source turntable - save £150 - only £700. There are so many bargains that you had better send to Glasgow your self-addressed envelope (we'll provide our own stamp!) and we'll send you a current list plus our new Accessory Newsheet.

THE LAST PARAGRAPH

As the Last UK Importers, we invite Trade Inquiries, but if you are needing a quick fix, you can get it direct from our shops or by post. Prices include VAT and UK postage First Class:-

FORMULA ONE: Power Cleaner for LP's.....	£12.50	FORMULA FOUR: Stylus Cleaner.....	£6.25
FORMULA TWO: LP Preservative.....	£16.95	FORMULA FIVE: STYLAST.....	£19.95
FORMULA THREE: LP Regular Cleaner.....	£7.95	FORMULA SIX: CD Micro-scratch protector.....	£13.95
FORMULA SEVEN: Cassette heads & path cleaner.....	£12.95		

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All shops accept ACCESS, VISA and AMEX on presentation or by 'phone and are licensed brokers. Instant and personalised credit readily available subject to normal requirements. We will shortly open a private Showroom and Service dedicated exclusively to ultimate components and systems optimising and invite you to contact Jack Lawson and obtain a copy of our Information Sheet No. 9 (Source Owners should request a copy of No. 8.)

DIRECTORY

CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM AMP MATCHING	VALUE	BACK ISSUE FULL REVIEW
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		Coll
Denon DL110 £60	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	BB	48
Denon DL160 £80	Average + Good	Although listeners just preferred the 110 its brother here proved a twin in lab tests and is still "thoroughly competent"	6-16g Low		43
Denon DL 103 £90	Average Good	This classic spherical stylus model gives a lively sound with powerful bass, and is popular in broadcast studios	6-16g Low	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		48
Dynavector DV10X IV £60	Average Average +	Fine sounding and realistically priced, damping is recommended to ensure successful tracking ability	8-18g R Normal		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		28
Glanz MFG 110EX £24	Average Average	A little bright but giving detailed bass and clear treble this was competitive at the price	6-16g Normal	R	Systems
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		48
Goldring Epic £18	Average – Average	An unpretentious "punchy" partner to a budget system, giving decent dynamics and focus	6-14g Normal	R	48
Goldring 1010 £33.95	Average + Average –	Listening results were a disappointment for a design which "looks right" in many respects	8-16g Normal		43
Goldring G1010 £34	Average Average	A bit fiddly to set-up but rewarding once accomplished. The big and bouncy sound belies its price. Sensitive to amp loading	10-20g Normal	BB	54
Goldring 1020 £49.95	Average + Average –	This one strutted finely onto stage but couldn't project to the "gods"	8-16g Normal		43
Goldring 1040 £74.95	Average + Average –	High frequency extension was improved by the van den Hul tip, nice looking model – no great actress	8-16g Normal		48
Goldring Eroica L £89	Average Average +	Open and relaxed sounding, the L version is just that bit more refined than its high output brother	7-18g Low	R	54
Goldring Electro II £135 complete	Average Average +	A pretty decent allrounder that did not excel sufficiently to warrant recommendation	8-16g Normal		43
Goldring Electro 11LZ Boron £199 complete	Average Average +	Well balanced sound but lacking low frequency authority, midrange focus and "punch"	12-20g Low		38 (Summary)
Grace F9E II £240	Good Good	For lively presentation, excellent separation and generally satisfactory sonic delivery – consider this model	5-10g Normal		48
Grado XTE + I £20	Average – Average	Bass and treble are a trifle coloured but the midband proved highly enjoyable. Ideal for budget systems	6-13g (damping) Normal	R	54
Grado XF3E + £45	Average – Average	Downtilting balance disguises the brightness of this cartridge; bit of a mixed bag at this price	9-20g (damping) Normal		54
Highphonic MCA3 £320	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		43
Kiseki Blue Silver Spot £395	Average + Good	Solid performance from a very solid cartridge but lacks some of the magic of other Kisekis. Compliance too high	5-12g Low		54
Kiseki Purpleheart Sapphire £675	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		Collection
Koetsu Black K £550	Good + Good +	Impressive in scale and dynamics but with some criticism of bass muddling and high treble fizz. Listen before deciding	6-18g Low	R	48/Coll
Koetsu Red £835	Good + Very Good	Named like a rare, and perhaps dangerous, little oriental fish this famous cartridge sounded "almost larger than life"	10-25g Low	R	48/Coll
Linn Basik £18	Average – Average	This goes much further in delivering the goods than its price tag might indicate	6-14g Normal	BB	48/Systems
Linn K9 £69	Average Good	Linn threw this model into the leading pack by beefing up the Basik's bodywork, adding a super stylus, and keeping the price fair	6-15g Normal	BB	48/Coll
Linn Asaka £279	Good + Good +	Disciples of Linn who are trying to realise their true "Karma" may find that saving money is not a short cut to heaven	9-18g Low	R	48/Coll
Linn Karma £435	Very Good Very Good	A specialist which is strongly recommended for Linn-based systems; results may be less predictable in more general application	9-18g Low	R	48/Coll
Linn Troika £625	N/A Very Good	Ex-Karma users have been seen with glazed expressions indicating smug self-indulgence the morning after fitting a Troika	8-18g Low		Coll
London Maroon £109	Poor Average +	Utterly different from other cartridges, the Maroon combines Heaven and Hell with good bass and midband but poor top-end control	8-16g + damping Normal		48
London Super Gold £248	Average – Good +	Sometimes a bit fierce in emphasising record surface faults, it is perhaps best at revealing the excitement and tension in music	8-20g + damping Normal	R	48/Coll
Madrigal Carnegie One £685	Average + Good	Looks like a duck but sounds much better, certainly worth auditioning. Compliance too high	5-11g Low		54
Milltek Aurora £198	Good + Good +	An overall feeling of relaxed ease characterised this clear and atmospheric Kiseki-built cartridge	8-16g Normal	R	48/Coll
Milltek Olympia £298	Average + Good +	Warm and detailed sound – packs the punch of the best m-cs with high output as a bonus	12-20g (damping) Normal	R	54
Mission 773HC £150	Good Good	A sufficiently well-balanced and competitively priced "old-timer" which still warrants recommendation	6-16g Low	R	38
Monster Alpha 2 £479	Good Good +	In the final analysis this fine allrounder is insufficiently exceptional in any specific respect to justify fully its high price	6-14g Low		Collection
NAD 9100 £12	Average – Average	Clearly a Best Buy model for rock music fans, opera and choral music lovers might do better to avoid its tracking (in)abilities	10-20g Normal	BB	38
NAD 9200 £26	Average – Average –	Although competent in many respects, overall the 9200 must be considered an undistinguished contender	6-19g Normal		28
Nagaoka mm4 £8	Average – Average –	Clear punchy sound that delivers the rudiments of a good performance	6-16g Normal	R	54
Nagaoka MP10 £17	Average Average	High frequencies sounded "shut-in" with this spherical-stylus model, but mid and mass were energetic, bouncy and punchy	5-13g Normal	R	48

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

CARTRIDGES

HI-FI CHOICE

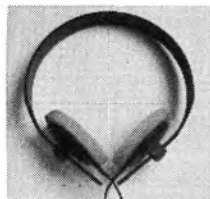
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DIRECTORY

CARTRIDGES

NAME PRICE	LAB SOUND	COMMENTS	ARM AMP MATCHING	VALUE	BACKISSUE FULL REVIEW
Nagaoka MP11 Boron £38	Average Average +	Responding well overall in PM's equipment and listening room, this model was mildly criticised for low level and dynamic limitations	5-13g Normal	BB	48
Nagaoka MP10SB £40	Average Average +	Stilton's mods have improved the fine detail resolution of this popular budget model	5-15g Normal	R	54
Nagaoka MP11 Gold £45	Average - Average +	There were mild criticisms directed at most areas, but in general the sound was clear, open and even	3-8g Normal	R	48
Nagaoka MP11 Gold SB £70	Average - Average	Excessive price loading for a blob of aluminium	2-6g Normal		54
Ortofon VMSSE II £14	Average Average	Sound quality was thought fair for the price, though a little 'untidy'	8-18g Normal		38 (Summary)
Ortofon OM5E £16	Average - Average -	The OM10 is a hi-fi cartridge - the OM5E is not	5-16g Normal		43
Ortofon OM10 £21	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	BB	48
Ortofon VMS 10E II £21	Average - Average -	Some of its stablemates fared rather better, and showed less evidence of tracking problems to boot	Normal		38
Ortofon VMS20E II £35	Average Average	One of the most popular cartridges ever, sound quality was a bit laid-back and tracking could have been better	3-10g Normal		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	R	48
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		48
Ortofon VMS30E II £52	Average + Average	Rather an old soldier in relation to turntable technology, it will perform undemandingly in demanding circumstances	5-13g Normal		38
Ortofon MC10 Super £65	Average Good	"What a delightfully sweet-sounding cartridge this is..." we said	5-15g Low	BB	48
Ortofon OM40 £75	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		48
Ortofon X3 £75	Average Average	A lack of bass power, definition and a "zitty" top end makes this competent but uninvolving	5-15g Normal		48
Ortofon MC20 Super £180	Average + Good +	An "inviting" sound quality; polite rather than exciting it approaches much more expensive models, but does not better them	6-15g Low	R	48/Coil
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		Coil
Ortofon MC2000 £450	Very Good Good +	There are few grounds on which to fault the MC2000, but extremely low output means the expense and aggravation of a transformer	5-10g Very low (transformer)		38
RATA RP20 £22	Average - Average	Good integration, a clear dynamic midrange and the beginnings of fine stereo imagery merits clear recommendation	6-14g	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	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		43
Rega RB100 £38	Average Average +	Remarkable mechanical performance in the right system context, but "try before you buy"	5-12g Normal	R	48
Shure M92E £15	Average - Average	Though lacking depth, the overall sound quality was competent, but treble was not its forte	10-15g Normal		43
Shure M99E £24	Average - Average -	Sister to the 92E this is a solid but not particularly exciting cartridge	5-10g Normal		38 (Summary)
Shure ME75ED £24	Average Average -	Rather bright and splashy in the high frequencies but nevertheless a competent model	5-10g Normal		38
Shure M104E £32	Average - Average	Capable in many ways, but giving no substantial improvement over the 92E in our view	5-15g Normal		38
Shure ME97HE £43.95	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	R	48
Shure M105E £45	Average Average -	A slightly 'spitty' sound lacking deep bass and dynamic contrast, but can be used in virtually every system where it will perform "unobtrusively"	5-12g Normal		38 (Summary)
Shure M110HE £55	Average Average	Sound quality was thought eminently presentable, but not exciting; smooth clear high frequencies, but a loss of bass definition	5-10g Normal		38 (Summary)
Shure M111HE £67	Average Average	Early reviews of this cartridge complained principally of the price - which has since come down	5-10g Normal		38 (Summary)
Shure ML120HE £95	Average + Average +	Quite decent sound quality and a generally fine balanced performance	6-18g Normal		48
Shure ML140HE £120	Average + Good	Qualitatively the treble of this well-balanced moving magnet model was a match for many moving coil cartridges	6-16g Normal		43
Shure V15 VMR £195	Good Average +	Initial listening gave promising results, but extended familiarity gave the feeling of a lack of energy and a "shut-in" sound	5-12g Normal		38
Shure Ultra 500 £452	Good Good	There was no doubting the accomplishments of what could well be the finest moving magnet cartridge around	6-14g Normal		48
Supex SM100E £115	Average Average +	Delivers as much musical information as many moving coils - the bass in particular having an attractive bounce	6-15g Normal		38
Supex SD900IV £350	Average + Good +	The 900 is an inherently fine cartridge, but despite a recent update it is beginning to show its age	10-18g Low		48/Coil
Supex SD901IV £375	Average + Good +	This high output model delivered sufficient subjective and objective performance, plus good compatibility, to justify its price tag	8-18g Normal	R	48
Supex SDX2000 £651 L £721 H	Good Good +	The high-o/p 2000 was preferred on listening tests to the low-o/p model, which even so has a unique place among the top designs	6-16g Either		48
Van Den Hul MC10 £699	Good Good +	A neutral balanced performer giving transparent midrange, fine depth and focus with firm extended bass. Gosh!	5-10g Low	R	48/Coil
Van Den Hul MC One £799	Good Very Good	This extended all the positive qualities of the '10 but added greater authority and scale - worth it for the extra money	6-12g Low	R	48/Coil

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

Sound us out.

Let me begin this month's dissertation by clarifying a point of confusion that has arisen amongst some readers due to our address. Both Alan Abbott and myself are dedicated music and audio enthusiasts. We aim to bring a quality of advice and service to the customer that is quite often unavailable in the high street shops. We have many years in the audio business both as customers and salesman on which to base our advice and well remember what it is like to be bombarded by the confusing and often conflicting advice of magazines and hi-fi sales people.

Both of us pursue other occupations and we pride ourselves on the fact that we are not under pressure to sell to the customers simply to earn a living. Here in our quiet, rural surroundings you will have the opportunity to audition a wide range of equipment in a relaxed and unhurried home atmosphere. No one will try and speed a sale along just to get at the next customer. When you arrive you are the ONLY customer and therefore deserving of our fullest attention. Take as long as you like, we would rather you came back two or three times before making your choice rather than let you leave with the vague feeling you may have made a mistake.

At the time of writing we are the only UK dealers to have the full range of Spica Speakers in stock from the giant killing TC 50 and the bi-wired TC 50 SE to the mighty Angelus. (At last a truly outstanding speaker of sensible domestic proportions). We are the first dealers to stock these fine transducers and within days of their arrival have already sold the first pair. Demand is going to be big, why not book your home demonstration with us now, or alternatively pay us a visit (by appointment only). We can offer the finest demonstration facilities available with completely honest and unbiased advice. (If we cannot fulfill your requirements then we are happy to suggest others who can).

Some recent additions to our range are the legendary Albarry Monoblock power amplifiers, the YBA pre and power combination. And let's not forget the magnificent LFD pre amplifier and Air 2:11 valve amplifier, the latter Alans reference power amplifier against which all others are judged.

For those who must have their cake and eat it, we have a full SAE system comprising CD player, tape, pre amplifier, power amplifier and tuner. Together they offer superb sound quality and harmonious aesthetics. The pre-amplifier is of special note demanding serious consideration as an audiophile unit in its own right. This unit will shake your faith in the minimalist approach to pre amplifier design! Priced at only £795. SAE could easily ask twice the price judged on sound quality alone, and comes highly recommended by the American audio magazine The Stereophile.

Kind regards,
BRIAN VOCE

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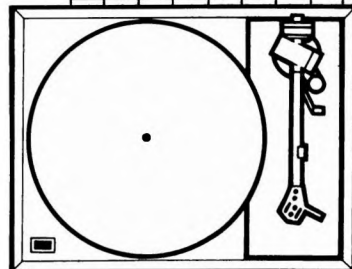
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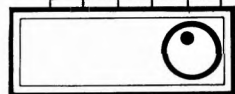
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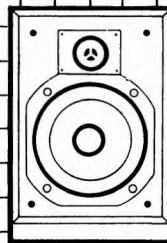
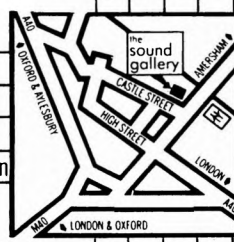
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DIRECTORY

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, and has as much to do with the elegance of the overload characteristics within a given system (valve amplifiers invariably sound more powerful than their rating would suggest). The listing of features provides some indication to the complexity of an amplifier: many users prefer to retain the option of tone controls to 'shape' the overall sound according to taste; many others have found living without tone controls surprisingly easy, with additional benefits in terms of transparency.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
A&R Arcam Alpha £149.90	Average+ Fair	This good all-rounder sounds musical if slightly softened. Good build and presentation	5 inputs hdph MM/MC tone controls 30W	R	50
A&R Arcam Delta 90 £329.90	Good Fair	Well balanced and sweet-natured in any given system with MC capability, but pricey	70W MM/MC 5 inputs tone controls		50
Albarré M408 II £595 pr	Good+ Good+	Unusually styled transistor monoblock power amplifiers reintroduced with improved performance and sound quality. Needs good warm-up for best sweetness and clarity	40W Power amp only	R	This
Audio Research SP8 £1998	Very Good Good+	The sound from this valve pre-amp was good enough to do justice to the finest ancillaries	5 inputs MM	R	39
Audio Research M100 £2850 each	Good+ Excellent	These high end valve monoblock power amps justify their cost by providing near state of the art sound quality. Our reviewer was so excited he bought them	100W	R	50
Audio Research SP11 £5150	Very Good Excellent	Current state of the valve pre-amp art. A reference point	Straight line MM/MC Disc + phase invert	R	50
Audiolab 8000C £300	Very Good Good+	Bettering the high standard set by the integrated 8000A this pre-amp sounds more tidy and refined, if a little clinical and cold	5 inputs MM/MC Disc hdph tone controls	R	50
Audiolab 8000A £325	Very Good Good+	A strong contender using high grade circuitry and providing good sound quality on all inputs. Hard to fault at the price	5 inputs MM/MC disc 50W hdph tone controls	BB	50
Audiolab 8000P £465	Very Good Good+	A gutsy performer providing high levels into both 8 and 4ohm loads. A power amp to keep the competition worried	100W	R	50
Beard P35 £695	Good Good+	A superbly built and engagingly rhythmic valve power amp, sounding sweet and slightly soft in the classic valve style	35W	R	50
Beard 506 £995	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	R	50
Beard M70 £1595 pair	Good Good+	A substantial British monoblock power amplifier, but not a great deal more impressive than the P35 at half the price	70W	R	50
Burmester 838 £1490	Very Good Good	A disc-only minimalist pre-amp, strong points include excellent build, extreme neutrality, dry clean bass and notably sharp stereo focusing	MC only, MM option		Collection
Burmester 846 £1599	Very Good Good+	Usually coupled with the 838 this high-level pre-amp provides many and versatile input facilities	6 inputs	R	Collection
Burmester 850 £3995	Good+ Good	Each of these mono power amplifiers contains separate high current 25W amps giving a refined coherent sound over most of the frequency range	100W	R	Collection
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 pre-amp provided excellent stereo imagery but was a touch 'heavy' in character	MM/MC disc	R	50
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 £6000+	Excellent V Good/Excellent	Cello's pre-amp represents a whole new ball game in flexibility and sound quality (or war of attrition on your wallet)	Optional inputs MC etc	R	50
Conrad Johnson MV50 £1795	Good+ Good+	Coupled with the PV5, this CJ power amp performed well on audition	50W	R	Coll
Conrad Johnson PV5 £2010	Good+ Good+	The PV5 is a classy sounding valve pre-amp, and natural partner to the MV50	5 inputs MM	R	Coll
Conrad Johnson Motif MC-8 £2500	Very Good Very Good	A cheaper alternative to the '7', this pre-amp is an undoubted success in maintaining the Motif sound but does not compare on sound quality	MM/MC	R	50
Conrad Johnson Premier Three £3775	Good+ Very Good	The Three is a musically accurate and graceful pre-amp which proved versatile on a wide range of inputs	5 inputs MM/MC		Coll
Conrad Johnson Premier Four £3900	Good+ Very Good	Ambience was the Four's forte – this power amp proved exceptionally revealing of instrumental locations	100W		Coll
Copland Pre and power amps £649 each	Good+ Fair	At £649 each this simple Danish valve pre/power combination is expensive, though the power amplifier sounds very easy on the ear	3 inputs MM, 12W		50
Counterpoint SA7 £747	Average+ Good	Simple valve Californian pre-amp offering inspiring transparency for the price	4 inputs straight line MM/MC	R	Coll
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	R	Coll
Creek 4040 £145	Average+ Fair	This simple integrated model had a controversial sound, liked by some, plus an acceptable lab performance	4 inputs MM 12W	R	50
Creek CAS 4140 £199	Good+ Good	Redesigned for '88, this is a fine allrounder with good moving-coil input, plain presentation	40W MM/MC 3 line inputs	BB	This
Croft Micro £150	Average+ Good	A real upsetter, this excellent valve pre-amp put the cat among the pigeons proving good sounds can be made at budget price levels	4 inputs MM straight line	R	Coll
Croft Super Micro £250	Good Good+	With industrial looks and double mono operation, it rated particularly well on disc input, although not so hot on CD	4 inputs MM straight line	R	50
Croft Series IVS £730	Good Good+	A lively and 'fast' valve power amplifier, delivering the goods with a pleasing 'classical' tonal quality	40W per channel	R	50
DBX CX3/DX3 £1500	Good Family Good	Versatile separates majoring on 4-channel surround sound and high power. Garish presentation and unexceptional sound	125W MM/MC 7 inputs, tone, 4-channel surround		This
Delta DPA 100S £1900	Very Good Very Good	A top-quality transistor power amp, sounding fast, articulate and well controlled, though maybe a touch clinical for some tastes	80W	R	50

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DIRECTORY

AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACKISSUE FULL REVIEW
Denon PMA-250 £125	Good Fair	As a "budget-plus" integrated amplifier the '250 gave an open sound with lively dynamics and should appeal to a wide range of tastes	30W MM hdph	R	50
DNM 3 £1000	Good+ Good+	The DNM3 in its acrylic case is a remarkably revealing and neutral state of the art pre-amp	5 inputs MM/MC twin vol controls	R	44
Exposure VIII £310	Very Good Good+	This power amplifier created a good impression of speed and power, but was a trifle fierce in the treble	50W	R	50
Exposure VII £340	Very Good Good	A double mono transistor pre-amp with a notably dynamic and punchy character, though not suited to all tastes	3 inputs MM/MC	R	50
Hafner DH120 kit form £295	Fair	We didn't build one; see below	60W		44
Hafner 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
Harman Kardon 640 Vxi £225	Good+ + Good	Moderately priced but built to HK's high standards; good value and good load tolerance	50W MM, 5 line inputs tone controls		This
Harman Kardon 655 Vxi £449	Very Good Good	Plenty of well built integrated amplifier for the money, with lots of power to drive almost anything, plus versatile inputs	100W MM/MC 6 line inputs tone controls	R	This
Hitachi 007 £299	Good+ Fair	Decent but unexceptional performance and sound quality, plus good facilities; represents a worthwhile improvement from Hitachi	75W MM 6 line inputs tone controls		This
Inca Tech Claymore £345	Good+ Good+	Limited facilities but a strong, clear, well-focused sound results in auspicious <i>Choice</i> debut for this relatively young company	50W MM/MC 3 line inputs straight line	R	This
JVC AX-22 £110	Average Poor	Serves a market that buys on features rather than sound quality. Includes special "flashing light" power meter	55W MM tone controls		50
Kenwood KA-550 £130	Good Fair	Decent sound quality and build at an affordable price, it also has a capable moving coil input – something of a rarity among the competition	40W hdph Tone controls MM/MC	R	50
Krell PAM5 £1589	Very Good Good	Superbly built, the Pam 5 pre-amp gave good definition throughout the frequency range with a good measure of excitement	MM/MC	R	50
Krell KSA50 Mk2 £2495	Very Good Good+	This power amp still holds its own with good depth and ambience and excellent stereo focus	50W	R	50
Krell KMA-100 II £5900 pr	Excellent Excellent	A genuine reference standard power amp, capable of justifying a wildly extravagant price tag in an appropriate system	100W, Monoblok	R	Coll
Le Tube £585	Good+ Good	If moving coil sensitivity is not required then this pre-amplifier will offer a clean view with very good stereo	3 inputs MM	R	44
Linn LK2 £373	Good+ Fair	This pre-amp was marginally less successful than the LK1 but the pair (of Linn's) worked well together and are well worth considering	5 inputs MM/MC		50
Linn LK1 £425	Good+ Fair	A durable tolerant power amp, setting a respectable standard on both lab test and audition	60W		50
Linx Stratos £999	Good+ Good	Facing strong competition in the UK this New Zealand pre-/power combination gives good sound quality... but not exceptional at the price	120W MM/MC straight line		50
Luxman LV100 £205	Good Fair	Nicely finished modern integrated amplifier, generally competent though not exceptional	45W MM 4 line inputs tone controls		This
Luxman LV-105 £599	Very Good Fair	Superbly finished and built, in a sense this model managed to capture the "valve" sound with an easy musical quality and good bass register	85W MM/MC		44
Magnum A100 £1995 pair	Good+ + Good+	Given their massive power rating a pair of A100's make a fine stereo power amp; ideal for high levels and with a wide dynamic range for digital programme	320W	R	50
Marantz PM26 £110	Average Poor	Well built and attractively presented this just manages recommendation, though sonically falling somewhat short of the best examples of its type	30W MM sliding tone controls	R	50
Marantz PM35 £160	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	R	This
Marantz PM45 £200	Good+ Fair	Generally pleasant and polite with above average clarity; there was some softening in the bass, restricting dynamic output somewhat	40W MM/MC tone controls	R	50
Meridian 201/205 £550/£395 each	Very Good Good+	A fine pre-amp with additional luxury option of full system remote, plus competent and attractive monoblok power amplifiers with generally good performance	100W MM/MC 6 line inputs remote capable straight line	R	This
Mission Cyrus One £150	Good Good	A reference standard amplifier for its price category the Cyrus 1 attained a high sonic standard. A stylish, neutral performer	5 inputs MM – medium MC 30W straight line	BB	50
Mission Cyrus Two £300	Good+ Good+	A significant improvement on the already competent "One", the 'Two remained neutral and confident over the whole frequency range	50W 5 inputs MM/MC Disc straight line	BB	50
Mission Cyrus Two with PSX £500	Good+ Good+	Although making the 'Two more powerful, the PSX power supply does not offer significantly better sound quality	A power supply, see above		50
Musical Fidelity A1 £249	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	This
Musical Fidelity B200 £299	Very Good Good+	Running cooler than other MF's, the B200 delivered fine musical and dynamic sounds with plenty of power	80W MM/MC 4 line inputs straight line	BB	This
Musical Fidelity A100 £439	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	This
Musical Fidelity Pre 3/P140 £299/£299	Very Good Very Good	Delivering true audiophile sound quality well ahead of their price, both components shine in their own right	70W MM/MC 4 line inputs straight line	R	This
Musical Fidelity P170 £499	Very Good Very Good	Acquitted itself well, later samples showing steadily increasing refinements	85W	R	50
Musical Fidelity MVT Mk 3 £1199	Very Good Excellent	The MVT pre-amp was "simply a knockout in its class", providing competition for £2000-plus amplifier systems	MM/MC 5 inputs	R	50
Musical Fidelity P270 £1199	Very Good Excellent	If the hot-box aspect is not a deterrent, this is something of a bargain. A big amplifier scale of sound which is just a little rough-edged	135W	R	50
Musical Fidelity A370 £2199	Very Good Excellent	Arguably the finest sounding power-amplifier manufactured in the UK	185W	R	50
Myst TMA3 £288	Very Good Fair	This excellently-constructed, no-frills, dependable amplifier should offer long life with above average sound quality	35W MM/MC 4 inputs		50
NAD 3020e £110	Good Fair	A little light in balance and "weight" but superior to run-of-the-mill budget amplifiers	20W MM/MC 4 inputs	BB	50
NAD 2200 £339	Good+ + Fair	Not recommended on grounds of sound quality, but worth serious consideration for its exceptional power output	100W		44
Naim NAIT £258	Average+ Fair	Well built with good load tolerance the NAIT delivered a fully competitive sound in spite of its modest measured power output	15W pc MM 3 inputs	R	50

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AMPLIFIERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Naim NAC 32 £425	Very Good Good	A natural partner to the Naim power-amps, with power supply options offering a spread of sound quality at different prices	MM/MC, 5 inputs	R	50
Naim NAP 250 £966	Very Good Good	Well-matched to the Naim pre-amps, and capable of high quality sound levels over the whole dynamic range	70W	R	50
Nakamichi CA7E/PATE £2500/£1700	Very good Good/Good+	Exceptional build and finish, plus good general performance, remote control and versatility, but expensive	200W MM/MC 6 line inputs, remote, tone controls		This
Nikko NA700 £189	Good++ Poor	Disappointing sound quality at an above budget price. Inescapably old fashioned	60W MM/MC 4 line inputs tone filters		This
Nuance £795	Very Good Good	A subtle civilised pre-amp though a little lacking in resolution and detail; suited to some tastes but not top-drawer	4 inputs MC	R	50
Drell 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	This
Pereaux SA3 £690	Very Good Fair	This exotic New Zealand-built pre-amp did not really offer the sort of sound quality expected at the price	4 inputs MM/MC		44
Perreaux 1850 £990	Very Good Fair	This power amp's musical qualities were disappointing, though powerfully delivered. Build and finish were exemplary	180W		44
Philips FA860 £239	Very Good Fair	Well balanced model from Philips' Japanese factory, with versatility, good build and finish	70W MM/MC 5 line inputs tone controls		This
Philips FA960 £289	Very Good Good	Japanese built high quality integrated model with versatile features and plenty of power	110W MM/MC 8 line inputs tone controls		This
Pioneer A331 £150	Good++ Fair	A new face for Pioneer, with improved standards of sound quality and value alongside traditional strengths of build and finish	50W MM 4 line inputs tone controls	R	This
Plenitude £795	Very Good Good+	Rating slightly higher than its Nuance partner, this power amp provided a tight, controlled sound, if somewhat lacking in scale and grace	80W	R	50
PS Audio PS4.5 £696	Very Good Good+	Sonically the best pre-amp in its class, but on the bright side, so purchasers should try it with their prospective equipment	MM/MC	R	50
QED A240 CD II £169	Good+ Good	Latest 240CD is fine value for CD and has competent MM disc input as well	45W MM 5 line inputs straight line	BB	This
QED A240 SA II £219	Good++ Good+	Redesigned 240SA represents a significant allround improvement over its predecessor, and provides a good moving-coil disc input in a competitive price	45W MM/MC 5 line inputs straight line	BB	This
Quad 34 £269	Very Good Fair	This well-built durable pre-amp has useful filtering and above average tone controls but was found lacking in sound quality (viz: detail/dynamics)	4 inputs MM/MC tone controls		44
Quad 405 £329	Very Good Fair	Not an impressive power amp but easy on the ear if not pushed and very reliable	100W		44
Quicksilver £1775 pair	Good+ Good+	A remarkable valve power amplifier with little to criticise; fast, articulate bass, neutral midrange and open clear top end	60W	R	50
Radford STA25 Renaissance £977	Good Good+	Offering superb midrange performance if not quite as good at the extremes, the Renaissance valve power amp is a genuine audiophile product	25W	R	50
Revox B250 £1128	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		This
Robertson Forty Ten £987	Very Good Good	Here is a neat little power amp (60W) you can fit and forget; it proved most satisfying over long listening sessions	60W		Coll
Rotel RA820A II £125	Good++ Good	This series II version of an established budget favourite delivers the goods sonically and is fine value for money	35W MM 4 line inputs tone controls	BB	This
Rotel RB/RC850 £130/£119	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	R	This
Rotel RA870BX £325	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	BB	This
Sansui AU-G11X £139	Good+ Fair	Tightly controlled if somewhat congested and lightweight, but a reasonable compromise between features and sound quality	25W MM hdph 4 inputs, tone controls	R	50
Sansui AU-G30X £199	Good++ Fair	A very competent amp with no glaring faults, performing well with phono and compact disc inputs	4 inputs MM 45W tone controls Hdph	R	50
Sansui B2301 £1880	Very Good Good+	Rating better than the pre-amp and providing generous power output, this amp could not be considered competitive in its price bracket	300W		Coll
Sansui C2301 £2306	Excellent Good	Sansui's flagship pre-amp did not really rate well given its price, but is not short on features	All facilities		Coll
Sony TAF 500ES £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 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
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	R	50
Technics SU-500 £100	Average Poor	Technics have something of a knack in creating models which just border on what we regard as the minimum standards for Hi-Fi. This is an example of that	40W MM hdph tone controls		50
Technics SUV55A £200	Very Good Good	A typically well built modern allrounder, with good versatility and sound quality	65W MM/MC 6 line inputs tone controls	R	This
Technics SUV85A £350	Very Good Good	Similar to '55 but with more power and better sound quality still	110W MM/MC 9 line inputs tone controls	R	This
VTL Minimal £340	Good Good	Providing decent sound quality at the price, this basic pre-amp sounded open and clear in mid and treble	3 inputs (MM)	R	50
VTL 50W £1150	Good Good	Rating good on audition and providing complementary characteristics to the minimal pre-amp, these monoblok power amps sounded a little slow and unrevealing	50W 3 inputs	R	50
Yamaha AX-300 £120	Good Fair	A lively and dynamic performer, offering a credible if bright sound at a competitive price	30W hdph tone controls (MM)	R	50
Yamaha AX500 £200	Very Good Good	A well built versatile performer with generous power, decent sound	90W MM/MC 5 line inputs tone, var loudness	R	This
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	This

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DIRECTORY

LOUDSPEAKERS

Last item in the hi-fi chain, to some extent the loudspeaker is merely the slave of what has gone before, capable only of reproducing a signal as good as it is fed. Nevertheless the distortions (colourations 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.

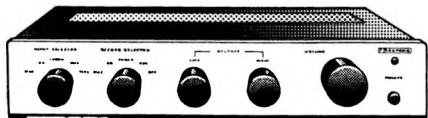
Careful placement of the loudspeakers within the room is as important as the initial choice of model. For good stereo they need to be more or less the same distance from nearby walls, and preferably on similar rigid stands. The listener should be about the same distance from and listening angle to each 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 Research 8BX £100	Average Average—	Spacious and informative sound quality with bass well under control. Not that there was much bass to control!	40 x 25 x 19cm shelf or 50cm stand near wall	88.5dB/W 70Hz		53
Acoustic Research 22BX £160	Average Average	Basically well-engineered with sound "nicely out of the box". Some of our "ears" were less enthusiastic	47 x 29 x 22cm shelf or 50cm stand near wall	89.5dB/W 55Hz	R	53
Acoustic Research 35BX £250	Average Average—	This is quite loud, with some boom and fizz, making it suitable for supine strummers of imaginary guitars perhaps	58 x 26 x 27cm free space on 40cm stands	91.5dB/W 55Hz		53
Apogee Scintilla £4950	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/Coil
A&R Arcam Three £150	Average+ Average—	Arcam's baby speaker did not delight our listeners, but it might do better in less expensive systems	34 x 18 x 23cm close to wall at head height	88.5dB/W		53
A&R Arcam Two £250	Good Average	Most things to most men this compact is unlikely to disappoint with its lively "bailly" character, though lacking weight... a bit	38 x 23 x 28cm near wall shelf or 40cm stands	88dB/W 55Hz		53
A&R Arcam One £349.90	Good Average+	Some boxiness in the midrange and fizz in the upper treble prevented this from getting the "R" tag	47 x 27 x 33cm open stands, free space	88dB/W 55Hz		46
Audiostatic ES200 £1495	Average Average+	Sounding forward and unbalanced with limited bass power, these excelled in transparency and detail, and might suit some tastes	150 x 53 x 23cm (w 10cm) stands away from wall	79dB/W 45Hz		46
Audiostatic ES300 £1995	Average+ Good	Marred by similar problems to its cheaper ES200 stablemate, this line source electrostatic was superb in the upper mid and treble but lumpy in the bass	44 x 5 x 93cm free standing	82.5dB/W 30Hz		46
Avance 120 £279	Average+ Average+	This unusual "after eighties" looking speaker has the recipe for success, but not quite the right seasoning yet	42 x 30 x 30cm 30cm from wall on 40cm stands	86.5dB/W 60Hz		53
B&W DM100i £119	Good+ Average	This market leader has recently been "improved" - though the original was good enough	37 x 22 x 22cm open stands near wall	89dB/W 75Hz	BB*	46
B&W DM110i £159	Good+ Average+	Another established favourite, it has recently been "improved", but not yet checked by us	49 x 26 x 25cm open stands	89.5dB/W 56Hz	BB*	46
B&W LM1 Mk II £249	Average+ Average	Probably one of the best 'micros' ever made, worth considering for special applications (boats or vehicles). Upgraded since our review	24 x 15.5 x 20cm shelf or flush mount	86.5dB/W 80Hz	*	31
B&W Matrix 1E £595	Very Good Good+	There was enthusiastic and consistent praise for these speakers with their "revealing and seductive" midrange	41 x 23 x 32cm free space on 35cm stands	85.5dB/W 50Hz	R	53
BBC LS3/5A £265	Good+ Average+	As a working tool it does its job but as a piece of value engineering this old timer is beginning to look a bit grey-haired	30 x 18.5 x 16cm open stands, free space	81.5dB/W 57Hz	R	Coil
Boston A4011 £110	Average Average—	Competent performance for size and price but below average relative to the IIK competition	34 x 21 x 20cm on stands near wall	88.5dB/W 63Hz		41
Castle Clyde £129	Average+ Average	A tidy little performer packing punch, but beginning to show its age in the light of new competition	37 x 21.5 x 22cm open space on stands	89.5dB/W 64Hz	R	46
Castle Durham £179	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 £269	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
Celestion DL4 (II) £119	Average+ Average	Strong stereo and controlled bass gave BB status, "shrill" top end only real criticism. (Now in untested Mk II form)	38 x 21 x 23cm stands near wall	89dB/W 85Hz	BB*	46
Celestion DL6 (II) £149	Average Average+	The control and power sets it well apart from the run-of-the-mill. It has since been updated	45 x 25 x 25cm open space on stands	88.5dB/W 60Hz	R*	46
Celestion DL8 (II) £199	Good Good	An easy speaker to live with that will not "close up" when driven loud. (Also updated since our review)	50 x 28 x 27cm on stands open space	88dB/W 55Hz	BB*	46
Celestion SL6S £350	Good Good+	A luxury compact speaker that gives a sweet treble sound with fine musical detail	37.5 x 20 x 27cm free space on 40cm stands	84dB/W 50Hz	R	46
Celestion SL600 £700	Good Good++	Clearly an exceptional device in terms of design and transparent sound quality. An audiophile miniature	37 x 20 x 25.5cm open space on stands	83dB/W 55Hz	R	46
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	Coil
Gale 301 £259	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 £599	Average+ Average+	Clean but rich and powerful bass; stereo focus was not a strong point, but it is worth considering	61 x 35.5 x 28cm on matching stands near wall	88dB/W 48Hz		46
Goodmans Maxim Two £80	Average+ Average	More wham-bam-thankyou-mam sound that imitates much bigger speakers when you let these babies yell. (A well-controlled yell)	26 x 17 x 19cm near wall on shelf or stand	86dB/W 85Hz	BB	53
Goodmans Point 3 £90	Average+ Average—	Recommended as good value for money, but our listeners' differing opinions mean your ears should judge for themselves	47 x 25 x 20cm shelf/high stand near wall	90dB/W 80Hz	R	53
Goodmans Point 7 £170	Average+ Average	Basically competent performance - mix and a lot of speaker for the money, but a certain lack of refinement nonetheless	69 x 33 x 26cm free space on 35cm stand	89dB/W 47Hz		53
Harbeth HL Mk 4 £475	Good+ Good+	Recommended for the good results at its price, and only mildly criticised for heavy bass and a mild 'chestiness'	64 x 33 x 30cm free space on 46cm stand	89dB/W 40Hz	R	53
Heybrook HB1 £169	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 HB2R £269	Average+ Average	Criticism of the mid and treble balance made this dynamic model less attractive on listening test than was hoped	41 x 23 x 23cm on stands, tilted, near wall	88dB/W 61Hz		46
Infinity Reference Standard IIB £3850	Average+ Good+	Sonically easy to live with, these had areas of truly great performance, but were complicated by many controls	160 x 57 x 30cm free space on low stands	90dB/W 25Hz	R	46/Coil
JBL TLX-3 GI £130	Average Average—	Lively and punchy but also untidy this little speaker may have deviated from the Hi-Fi standard but cannot be summarily dismissed	38 x 25.5 x 22cm free space on stands	87dB/W 55Hz		46

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Stereophile, U.S.A. September 87.



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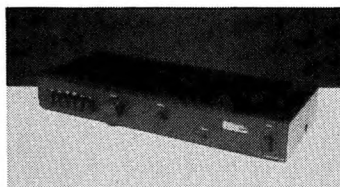
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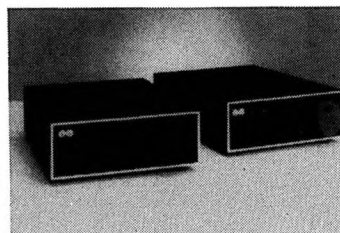
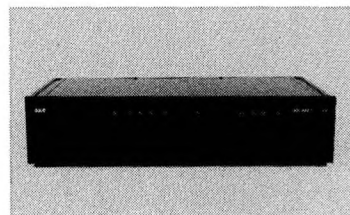
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DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACKISSUE FULL REVIEW
JBL L 60T £370	Good+	Well balanced and offering realistic value for money, the fine treble and extended bass make it suitable for larger rooms	78 x 30.5 x 26.5cm low stands or floor	88dB/W 40Hz	R	46
JBL 18Ti £559	Good+	Beautifully engineered, well finished miniature with many good points, but unexceptional overall. Try the cheaper L20T	34 x 24 x 22.5cm 50cm from wall on rigid stands	85.5dB/W 53Hz		46
JBL 250Ti £3300	Good+	In general this speaker did not show the required level of dynamic presentation transparency and stereo depth expected of a pricey flagship model	132 x 57 x 36cm free space on floor	89dB/W 53Hz		46
JPW AP2 £145	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	BB	53
JPW AP3 £210	Good	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
JWS Quintet £100	Poor	Poor stereo focus with up to 3dB channel difference, coloration, boom, "sting" and the grille rattled.	46 x 19 x 19cm close to wall head height	88dB/W 55Hz		53
KEF C10 £94	Good	Listening panelists gave this a poor reception	30 x 20.5 x 17.5cm stand near wall	87.5dB/W 75Hz		46
KEF C40 £209	Average+	Criticisms were made of a lack of fine detail and loss of depth and transparency, but it could handle power well	65 x 24.5 x 26.5cm free space on stands	90dB/W 55Hz		46
KEF 103/3 £630	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) £800 (£900)	Very Good	A reference point for dynamics, preferred without KUBE, suited to many rooms	90 x 28 x 41.5cm floor standing in free space	92dB/W 50Hz	R	53
KEF 107 £1890	Very 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	Coil
Linn Kan £271.95	Average—	The acid test of "blind listening" may dissolve the Kan's high status with strong criticism, but the answer, as always, is: "suck it and see"	30.5 x 19 x 16.5cm back to rear wall on rigid stands	85dB/W 90Hz		41
Linn Isobarik £1568	Good	Exceptional capabilities in the dynamic range and bass performance, demands serious consideration as a state of the art contender, but odd stereo	76 x 33 x 41.5cm low stands against rear wall		R	Coil II
Magneplanar SMGa £697	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 MGIIla £2750	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	84.8dB/W 35Hz		46
Marantz LD20 DMS £130	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
Meridian M30 £725	Average+	Pricy but easy on the ears and worth considering especially where space is at a premium	38.5 x 18 x 32cm free space on stands	Active 40Hz		46
Mission 70 II £109	Good	Lively and transparent, the 70 II was favoured for its speed, though the sound had a mildly 'thin' tonal balance	35 x 21 x 21cm on stands or shelf near wall	89dB/W 66Hz	BB	46
Mission 700LE £139	Good	Mission re-submitted this popular model and again got a positive review - which proclaims their (and our) consistency	38 x 21 x 21cm straight ahead stand near wall	89dB/W 66Hz	R	53
Mission 737 £249	Average+	To its credit the 737 was generally articulate and well integrated but stereo was poor and it could sound loud and hard	54 x 25 x 27.5cm low stands near wall	89.5dB/W 58Hz		46
Mission Argonaut £700	Good	Perhaps not the most subtle or sweet these were recommended for their excitement, drama, power handling and... good looks	95 x 23 x 31cm floor-standing near wall	91dB/W 40Hz	R	53
Monitor Audio R100 £130	Average+	Tonally quite neutral, but with small box character, negligible low bass and a rather 'hard' mid-range	40.5 x 25 x 21cm free space on stands	87.5dB/W 70Hz		46
Monitor Audio R252 £150	Average+	Rating well for its price this model displayed a rather rough top end and a generally dry character helped by good detail and focus	47 x 25 x 24cm stands quite near rear wall	89dB/W 62Hz	R	46
Monitor Audio R352 £250	Good	Well-built and finished, 'sensitive' speaker which is easy to drive and capable of extracting good results from any good amplifier	64 x 25 x 32cm on stands in free space	90dB/W 50Hz	R	46
Monitor Audio R700 MD £269	Average+	Lively and involving with good, punchy, if rolled off bass. The metal dome speaker gives a clean and open treble	32 x 21.5 x 25cm on stands 0.4m from wall	87.5dB/W 62Hz	R	46
Monitor Audio R352MD £280	Good	Better suited to CD than vinyl perhaps, this is clearly good value for money. But some found it coarse while others praised its cleanliness	64 x 25 x 32cm 25cm stands in free space	89dB/W 42Hz	R	53
Monitor Audio R652 MD £369	Average	Mild bass and crossover weaknesses were criticised, but the sound was quite well liked and it is decently built	51 x 20 x 26cm free space on 40cm stands	86.5dB/W 45Hz		53
Mordaunt Short MS10 II £90	Average	One of the best miniatures around. A borderline Best Buy because of the bass limitations, which may depend on your taste	29 x 20 x 17cm wall bracket	86dB/W 75Hz	BB	53
Mordaunt Short MS100 £179	Average+	A mid 'forward' tonal balance is main drawback but other aspects such as ambience, transparency and stereo depth compensate	32.5 x 22.5 x 21.5cm stands near wall	85dB/W 80Hz	R	46
Mordaunt Short 45Ti £220	Good	A sensitive tandem-bass number that can be driven loud but loses its balance a bit and can be unsuitable	63 x 26 x 30cm low (20cm) stand near wall	90.5dB/W 52Hz		53
Mordaunt Short MS300 £309	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+	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	53
Quad ESL-63 £1458	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	46
Rogers LS2 £170	Good	A coherent and polite speaker considered more suited to classical music. Tonally well balanced, neutral and with good power handling	36 x 23 x 22cm on stands near wall	86.5dB/W 51Hz	R	46
Rogers LS6 £240	Good+	Sonically fitting in between the LS2 and 7, the 6 was a consistent success on audition - well balanced with an open and informative nature	51 x 27 x 28cm open stands, free space	87.5dB/W 50Hz	BB	46
Rogers LS7t £360	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 46Hz	R	53
Roksan Darius £1150	Average	A controversial speaker which when set up right can deliver impressive performance, but with a far from neutral balance	98 x 31 x 51cm integral stands near side walls	88dB/W 50Hz		53
Rotel RL850 II £120	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	53
Royd A711 £99	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		53
Royd A25 £100	Average+	Receiving mixed reactions on audition, the A25 is flawed but offers a lot of speaker for the money	51 x 29.5 x 24cm, stands near wall	87dB/W 52Hz	R	46
Sony APMT0ES £100	Average	An obvious Best Buy at its highly competitive price point, it can do justice to a good hi-fi system of Sony or specialist origins	40 x 25 x 20cm, 40cm stands 40cm from wall	87dB/W 55Hz	BB	53

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DIRECTORY

LOUDSPEAKERS

MODEL PRICE	LAB SOUND	COMMENTS	SIZE PLACEMENT	SENSITIVITY BASS FROM	VALUE	BACK ISSUE FULL REVIEW
Spendor Prelude II £320	Good+ Good	Good clarity and detail were evident everywhere in this speaker. Though a little boxy or muddy in the midrange it is strongly Recommended	50 x 26 x 28cm open stands in free space	88dB/W 52Hz	R*	46
Spendor SP2 £420	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	46/Coil
Spendor SP1 £640	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	46/Coil
Spendor SA3 Passive £1320	— Good+	Same as Spendor SA3 active	85 x 38 x 46cm low	89dB/W 32Hz	R	46
Spendor SA3 Active £2308	Good+ Very Good	Substantial speakers designed to deliver high sound levels and killer bass. Suited to larger rooms and power hungry ears	85 x 38 x 46cm low rigid stands in free space	89dB/W 32Hz	R	46
Spica TC-50 £595	Average+ Good	These American wedge-shaped-cabinet speakers just merit recommendation at their price and were detailed and clear	40 x 33 x 28cm free space on 50-60cm stands	85dB/W 48Hz	R	53
Tannoy Westminster £3300	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	Coil
Technics SBC 250EK £130	Average+ Average—	Despite a fairly even tonal balance, the 250EK sounded muddled in the midrange and dull in character	36.5 x 23.5 x 20.5cm free space, stands	86dB/W 60Hz		46
Technics SB-RX50 £500	Very Good Average+	With its unique coaxial drive unit the RX50 proved a smooth and well balanced loudspeaker, its minor weakness being a mildly excessive low bass	48 x 30 x 26cm free space on 40cm stands	86dB/W 40Hz	R	46
Wharfedale 504 £139	Average+ Average—	Acquitting itself well on audition, the 504 produced a clear, reasonably balanced sound with above average treble	21 x 18.5 x 20cm stands, near wall	85dB/W 75Hz	R	46
Wharfedale Delta 50 £130	Average+ Average—	Given the price this was a mild disappointment – there is nothing obviously wrong but it just seemed a bit mundane	48 x 27 x 19cm near wall on 40cm stands	88dB/W 55Hz		53
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
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

TUNERS

The radio medium operates at a much lower profile than TV, but in areas outside pop music the BBC service is the envy of the world. Live Prom concerts can rival all other sources from a hi-fi perspective. Only the FM (VHF) bands give stereo hi-fi sound, though AM (MW & LW) are useful for receiving certain transmissions in the UK. Something of a hi-fi afterthought, tuners are

often selected merely to match a chosen amplifier cosmetically. However, the task they carry out is far from simple (or cheap), combining the skills of RF (reception) and audio (signal processing) engineering. The importance of the former will depend on local reception conditions, but money invested in a high quality outside aerial system is usually well spent.

Tuners come in two basic types. Analogue models tune gradually (and usually manually) across the bands, and can have analogue or digital displays; they are often preferred for sound quality, and are certainly best for AM bands. Digital tuners offer convenient automatic tune facilities and hold many station positions in pre-set memories.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
A&R Arcam Alpha £149	Good Average+ +	Attractively classic British analogue tuner with sound quality comfortably better than most	FM/AM Analogue	BB	50
A&R Arcam Delta £270	Very Good Very Good	Hi-fi sound on FM, good on AM, a dependable British all-rounder	6AM, 6FM presets, FM/MW, LW display manual tune	BB	55
Creek CAS3140 £150	Very Good Good+	A true front-rank tuner, excellent ergonomics and audiophile sound quality albeit with the minor handicap of having FM only	FM only	BB	50
Denon TU 450L £130	Average+ Average+	Poor AM sound quality may be a deterrent but the FM performance fully merits recommendation	FM/AM Digital	R	50
Harman Kardon TU920 £299	Good Average	Rather weak sound quality for the price despite good lab test results	16 presets, AM/FM, digital auto scan, active tracking		55
Harman Kardon TU915 £325	Good Good	This gave good FM performance but was thought "wretched" on AM (Psst... you don't necessarily buy a tuner for the AM.)	FM/AM 16 presets auto seek		50
Hitachi FT-MD 5500 £230	Excellent Good+ +	A powerful, good sounding tuner with versatile facilities	16 presets, FM, AM, MW auto scan digital, signal meter	BB	55
Hitachi FT5500 II £230	Very Good Good+	Soundwise highly rated on FM, and on AM basically satisfactory – a versatile all-rounder	Auto and manual tuning 16 presets	R	44
JVC FX-1100 £355	Good+ Average+	A sophisticated model with 40 (!) AM/FM presets although the sound was unexceptional at this price level	Multi function computer, signal meter, digital auto tune		55
Marantz ST35L £160	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 £495	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
Mission Cyrus £180	Average Good+	Best Buy material on sound quality but radio frequency performance let it down	FM/AM auto seek tuning	R	50
Musical Fidelity Ti £300	Good+ Very Good	Top class FM stereo sound on good signal strengths from this audiophile model. Watch out for local CB!	FM only, analogue box dial, manual tune, signal meter	R	55
NAD 4020B £139	Good Average+	Not the quietest or most sensitive tuner tested, it still provided good sound for the money, being "musical and ambient"	Analogue FM/AM	BB	50
Naim NAT 01 £1098	Very Good Very Good	There may be better sounding tuners in the world, but we have yet to hear one	No presets. Two box, flywheel tuning FM only, Analogue	R	50
Nakamichi ST-7E £750	Good+ + Good+	Exceptionally good for weak-signal areas, and good all round	16 AM/FM presets, Schotz enhanced sensitivity, auto time digital		55
Nikko NT-540 £154	Good Average	Lab report was promising but the sound was rather dated	8 presets, AM/FM, digital auto scan		55
Onix B.W.D.1 £520	Good+ + Good	Unexceptional sound despite the costly power supply option	FM only, manual digital, variable bandwidth		55
Pioneer F551L £100	Good+ Good+	High value budget tuner, very little to argue about (includes long wave)	12 FM, 12 AM presets, auto scan, digital and signal strength meter	BB	55
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 B261 £1174	Excellent Good+	A sophisticated and well-executed example of modern broadcast design; could be the logical choice for the deep-pocketed radio enthusiast	FM only, twin headphones, 20 presets	R	50
Rotel RT-830L £110	Good+ Good	Fine sounding budget audiophile material, no frills, no fuss	Manual dial analogue, FM, MW, LW	BB	55

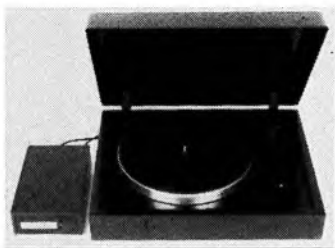
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DIRECTORY

TUNERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Rotel RT-850L £150	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
Sansui TU-D99XL £249	Very Good Good+	This slimline compact model gave good FM sound quality and strong RF performance. But the AM sounded unpleasant	FM/AM, 16 presets	R	50
Sony ST 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	50
Tandberg 3001 £1295	Excellent— Good	An enthusiast dx model, versatile performance and generally good sound; excellent build	8 presets, FM only, analogue, manual dial, var. bandwidth, signal meter		55
Technics ST-500L £100	Average+ Average+	Fine RF performance and fair FM sound at bargain price = Recommended tag. Alas the AM sounded as if it was coming "down a long furry tunnel"	FM/AM 16 station presets, scan	R	50
Technics STG45AL £140	Good+ Good	Good sound on FM, weak AM but clever facilities and a good lab test	16 FM presets or 8 FM/8 MW-LW, digital auto scan, auto memory	R	55
Technics ST-G7 £400	Very Good Good+	Muffled AM, but fine stereo FM quality and well built	16 presets, digital	R	50
Yamaha TX-1400 £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

CD PLAYERS

This new all-digital music source seems set fair to becoming properly established, despite still high disc prices and the opposition of many hi-fi enthusiasts. Compact Disc's strengths over conventional vinyl are complete freedom from surface noise with automatic and programmable play, plus track skip and fast music scan - frequently under full remote control. However, many

vinyl enthusiasts find CD's sound less involving than top quality vinyl replay.

Introduced five years ago at around £500, CD players now average half that price, and for the main offer improved performance besides. Even cheaper players may have the latest decoding chips and the most useful play features; extra money can buy remote control, audio 'tweaks', plus improved build

and component quality control.

Compared with many hi-fi components, CD players give impressive lab performance, though there are differences between players nonetheless. **Sound quality** variations are even more marked, particularly in a good quality system. As it behaves very like a pre-amp, there are no problems connecting a player to a normal amplifier.

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Acoustic Research CD-04 £290	Good Average+	Stylish but basic player, based on Philips 14-bit 4 x oversampling with respectable sound tweaks and remote control	Remote Control, headphones	R	51
ADC CD-250X £230	Good+ Average	Well made and engineered, and above average soundwise; trumpets could sound 'thin' though violins were liked so it may prefer Stephan Grappelli to Miles Davis	Skip and search, manual, repeat and 16-track programming	R	53
Aiwa DX-500 £179	Average— Average—	Adequate build quality and reasonable features, but this unit did not do very well in the lab and was sonically a disappointing experience	No remote control or headphone socket, but scan, skip, search etc		53
Akai CD-A70 £299	Average Average	A full feature 16 bit 2 x oversampling remote control player with fine presentation and finish and a pleasantly laid back sound quality	Full width rapid access, keypad programming, remote control		51
Cambridge Audio CDI £1500	Good+ Excellent	Advanced design and circuitry give this top class two-box machine exceptional performance, so the intrinsic qualities of CD, (eg. silent surfaces), make themselves felt	No headphones, seven audio filters, skip and scan	R	Coll
Denon DCD 300 £210	Average+ Average+	Unspectacular all round competence with remote control can't be bad at the price	Skip, remote control, headphones	BB	51
Denon DCD 1700 £650	Good+ Good+ +	The overall sound was strong and coherent approaching reference standards. Fine build quality and facilities make this a firm contender	Remote, skip, scan, headphones, programmable	R	51
Denon DCD-3300 £1200	Good+ + 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, headphones		51 51
Goodmans GCD-500S £160	Average— Average—	User-friendly but flimsy build quality and second class sonics make this poor value even at the price	Audible scan and track skip, programming		51/45
Harman Kardon HD100 £399	Average Average—	With a mixed subjective performance this well built player failed to make the grade in its price class	Skip and scan, programmable		51
Hitachi DA-7000 £180	Good Average	Generally competent, especially considering the price, this was well built and styled if lacking in some facilities - a good budget starter	Memory and repeat, plus the basics	BB	53
Hitachi DA007 £300	Average Average	Unusually fitted with wooden end cheeks and comprehensively kitted out, but only average in sound quality	Full remote control, adjustable headphone output keypad programming		51
JVC XL-V1100 £659	Average+ Average+	A substantial and very well built flagship model with 16 bit 4 x oversampling, though sound quality was disappointing at the price	Full remote, headphones, scan, skip, intro-scan		51
Kenwood DP990D £299	Average+ Average	A good all-round package, just deserving recommendation, but comparable sound quality can be found more cheaply elsewhere	Headphones, remote control, (manual override)	R	51
Luxman D-100 £449	Average Average—	Sparsely equipped with a slightly old-fashioned sonic character, offering little but physical weight for a quite high price	Remote control, skip, scan, headphones (variable)		51
Marantz CD273 £199	Good Good	An ambitious machine at the price, offering pretty good sound quality but a slightly below average build standard	Skip, scan, programmable	BB	51
Marantz CD873 £240	Good Good+ +	Putting many 'audiophile CD's to shame in terms of sound quality this proved another winner, though there was slight criticism of control accessibility at times	No remote control, but the usual skip, scan etc	BB	53
Marantz CD-273SE £240	Good+ Good+	The Euro-tweaked version of the standard 273, this model fulfills pretensions to audiophile standards at a budget price	Manual control, skip and scan (audible), 20 track programming, repeat	BB	51
Marantz CD65 £250	Average+ Good	Comfortably above average sound quality, this best selling model still represents good value for money	Search and programme, manual control	BB	51
Marantz CD75 £300	Good+ Good+ +	It delivers a sound quality that can rival machines twice the price even though it may lack some luxury touches	Remote control, search, programmable	BB	51/Coll
Marantz CD94 £800	Good+ + Very Good	Clearly the best Marantz CD player, with high build quality and good objective and subjective performance	10 digit keypad, headphones, favourite track selection, remote	R	51
Mission PCM7000 £600	Good Good+ +	Stylish with a large informative LCD display this deserves recommendation on the basis of sound quality alone	Remote volume control, digital filtering	R	51/Coll
Nakamichi OMS-3E £995	Good Good+	Superbly built and presented this expensive machine was a bit of a "stuffed shirt" when it came to sound quality	Remote control, skip and scan, headphones		51

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DIRECTORY

CD PLAYERS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
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, headphones	R	51
Nakamichi OMS-5EII £1500	Good+ Very Good	"... delivers near state of the art performance and build quality in a deliberately starkly functional package, but at a very high price..."	Skip and scan, simple track programming, manual control		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
Philips CD 160 £200	Good Average+	A little tinny in construction and "plasticky" in feel, this popular model rated well on sound quality despite its budget price	Skip, (20 track) programming, repeat/display	BB	51
Philips CD360 £250	Good+ Good+	Fine lab performance and exceptional listening test results, plus the 200 disc favourite track selection makes this modestly priced unit a Best Buy	Remote control, favourite track selection, skip	BB	51
Philips CD473 £250	Good Good+	In the forefront as regards sound quality, this is one of the best sounding Philips players yet; we were unable to catch it out on classical through Jazz program	Favourite track selection, remote control with volume, headphones etc	BB	53
Philips CD960 £700	Good++ Good++	Simple to use with exemplary lab performance, this showed no sign of weakness while sound quality improvements over mainstream models more or less justify the price	Full remote control, favourite track selection, etc	R	51/Coll
Pioneer PD-6050 £230	Good Average+	Much liked on Jazz and rock program this was highly rated in terms of value for money. The midrange sounded a little forward and thin though	Everything but a digital out socket and remote volume control	BB	53
Pioneer PD-M70 £399	Average Average	A remarkable catalogue of features justify the price. Soundwise it rated just above average overall	Remote control, 6-disc autochanger, 8 programme memory, headphones etc		51
Revox B226 £756.70	Good+ Good	The traditional Revox house style is combined with the fine Philips 16 bit chip set, but this player doesn't really offer sound quality to match the price	Infra-red remote control, full search, scan, programming		51/Coll
Sanyo CP17 £200	Average- Average-	A no-frills mid-sized package, this was not up to the usual Sanyo sonic or technical standards but it was well built	Skip, search, repeat, 16-track memory, programmable		53
Sharp OX-R700H £249	Average- Average-	A workmanlike player that does not offer exemplary lab or sound quality but which is well-built with good facilities and should perform well in use	Remote control, track selection keypad, skip, scan repeat programming		53
Shure Ultra D6000 £495	Average+ Average+	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 S01 (by CI) £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-M20 £179	Average+ Average	Keeping pace with improvements in the marketplace, it combines decent performance with good build and is competitively priced	20 track programme, skip and scan, repeat and random play	R	51
Sony 030 £230	Average- Poor	At 50p per hour to run, the sound quality is poor compared to mains machines although reasonably competent overall for a Discman	LCD display, skip, shuffle, and repeat, "in-ear" headphones		51
Sony CDP-310 £250	Average++ Average	Fine build, facilities and healthy enough sound quality - recommended, but look around the range	Remote control (+ usual)	R	51
Sony CDP-M50 £269	Good+ Average+	Fine build quality, good technical performance and extravagant features make this a very competitive package	Shuffle, skip, search, remote headphones	R	53
Sony CDP 710 £299	Good+ Good++	One of the outstanding contenders in our 1987 edition. The build was cool; the sound was hot	Remote control, 20 digit direct entry keypad, etc	BB	51
Sony D100 £300	Average Average-	The best all round portable tested, but also the most expensive, and still no substitute for a conventional player	Skip, repeat, 21 track programming, headphones, LCD display		51
Sony CDP-222ES £449	Good Average+	Exceptional build quality and presentation plus respectably good sound quality merits the "R", but some of its kin were preferred	Remote control, 20 digit keypad, track access, programming	R	51
Sony CDP 555es £1000	Very Good Very Good	Extravagant build quality, sophisticated features and near state-of-the-art performance, it competes effectively with more expensive models	Remote control, 20 digit keypad, track access, programming	R	51
Technics SL-P 111 £179	Good Average	An above average sound quality at a well below average price, but this is only most things to most men	Skip, audible scan, programme repeat, preset edit play	BB	51
Technics SL-P220 £229	Average++ Average	Sound quality keeps this out of the top ranks but the facilities (wow) and fine technical performance will make it hard to resist for some	Everything except a digital out socket, which is no great loss to most	R	53
Technics SL-XP5 £250	Average- Poor	A contender for the "World's smallest" title, this beautifully crafted miniature falls short in terms of sound quality	Headphones, "high cut" filter, skip, search		51
Technics SL-PS20 £350	Good+ Average+	With features and facilities to satisfy the most eager button pusher, this also produced decent sound quality	High/Low scan ratios, headphones, memory, programming and more	R	51
Technics SLP 720 £400	Good++ Good+	More buttons for sonic pilots - this was the most sonically super of the top Technics models	Search dial cueing, high scan speed optics, disc menu, programming	R	51
Technics SL-P1200 £800	Good++ Good+	Looking more like a desk work station than a stackable component, this will appeal to the creative recordist and semi pro user. Sounded pretty good	Headphones, remote control, search dial cueing, etc		51
Yamaha CD-X5 £180	Average+ Average	Good build quality, respectable lab performance, and decent enough sound delivery for your money	Skip, scan, manual only, etc	R	51
Yamaha CDX-900 £450	Good Average+	A real button bristler with extensive facilities; well built, but sound quality might suggest a lower price	Programme calendar, remote control, 26 key direct track entry		51
Yamaha CDX-1100 £700	Good+ Average+	A pearly king might like the button overkill here... yet despite exceptional lab performance, listeners were not unduly impressed. It's worth considering	Volume handset, random play, space insert, 26 direct track entry keys		51

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 - see **Comments**.)

There is no problem in connecting a cassette deck to any normal amplifier, but some care needs

to be taken in choosing the best tapes for a specific machine. (Trial and error is one effective technique, but many decks have manual bias adjustment and some match up to the tape automatically.) Lab performance and sound quality often go hand in hand, and are frequently somewhat dependant upon factory alignment. The mechanical integrity of the mechanism itself is another crucial factor, that is often reflected in the asking price.

All modern hi-fi decks have Dolby B and the majority have Dolby C besides; the very worthwhile HX Pro system is becoming steadily more

widespread. Remote control remains rare, though sometimes it is available as a system option. Three-head recorders allow simultaneous checking of the recording being made. Auto-reverse is a useful convenience feature, but usually with some mechanical compromise, while double-mechanism 'dubbing' decks of dubious quality are fashionable at the bottom end of the market. The welter of different 'music search' systems available is some indication of their frequent ineffectiveness.

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa AD-F260 £90	Good Poor	Well equipped conventional budget recorder measured rather better than it sounded	Dolby B, C, Bias adjust, auto tape select		52
Aiwa AD-R460 £149	Average Average-	Some worthwhile features but sound quality was not especially liked	Auto reverse, Dolby B, C, Track search, Bias adjust		52

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 60

DIRECTORY

CASSETTE DECKS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Akai GX-6 £329	Good Good	There is a strong sense that someone has really thought this one through; it has an indefinable 'specialness'	Dolby B, C, Bias adjust, Track search	R	52
Denon DR-M07 £140	Average+ Excellent	Despite minor operational and measured shortcomings, sound quality is excellent for the price	Dolby B, C, Record bias adjust	BB	52
Denon DR-M12HX £220	Good Good+	Well constructed and pleasant to use, a lack of true pitch constancy kept it from sounding superb	Dolby B, C, HX Pro, Track search, Bias adjust	R	52
Denon DR-M30HX £319	Good Good+	Ergonomically fine with infra red remote, the M30 fared well on pre-recorded material and was at its best with ferric tapes	Infra Red Remote, Dolby B, C, Hx Pro, 3 Head, bias adjust	R	52
Denon DR-M44HX £400	Excellent Excellent	A well designed deck that also performed fine sonically, working very well with ferric and metal tapes	3 head auto tape set up, real time counter, Dolby B, C, HX Pro,	R	52
Harman Kardon TD202BL £249	Average Average	A competent middle-ranking performer but lacks sonic incisiveness and is a bit expensive	Dolby B, C, Bias adjust		52
Harman Kardon CD491 £695	Good Good+	Excellent audio engineering and tremendous flexibility make this an audiophile cassette deck 'par excellence'	Dolby B, C, MPX Bias/Sensitivity adjust, Track search	R	52
Hitachi D-007 £300	Average- Poor	This double 'dubbing' deck proved a mixed bag - good in parts but disappointing overall	Continuous auto reverse, twin deck, Dolby B & C, dubbing, High Speed		52
JVC TD-X202 £130	Average Average	A bit of a mixed bag, with rather basic controls and an unimpressive sound quality	Dolby B & C		52
JVC TD-X502 £250	Average- Average	Inconsistent sound quality and lab performance, alongside complex ergonomics and elaborate search facilities	Dolby B & C, Music Search, Intro Scan, Remote Option		52
JVC TD-V66 £350	Average Average	A user-friendly modern player marred by a 'lazy' undynamic sonic character	Auto Tape Sel., Track Search, Dolby B & C		52
Kenwood KX550HX £150	Average Average+	This well-laid-out and attractive deck ultimately lacks the edge to stand out in a competitive field	Dolby B & C, HX Pro, Auto tape select, Track search		52
Luxman K-100 £199	Average+ Average+	Poorly laid out but it fared quite well on metal tapes. Commercially recorded tapes sounded bright and cramped, however	Dolby B & C		52
Luxman K-105 £349	Average Average	Rating quite well for an auto reverse deck, and featuring complex track search facilities, it was not sonically competitive on price	Auto Rev, Dolby B & C, Auto Tape Sel.		52
Marantz SD-35 £160	Good Good+	Rock steady tape transport gives very competitive sound quality for the price. Based on rock steady tape transport, this slightly bright replay may not appeal to some	Auto Select, Dolby B & C	BB	52
Marantz SD-4511 £200	Good+ Good+	Well built and dynamic sounding player, working better as a recorder than with musicassettes	Dolby B & C, Separate MPX, Auto selection	R	52
Marantz CP230 £250	Average Average	This is a competitively priced portable recorder though not suited to replay of musicassettes	Dolby B, Bias adjust, Pitch control, Portable	R	52
Nakamichi CR-7E £1500	Excellent Excellent	Remarkably this deck is not only ergonomically but also sonically superior to the Dragon, particularly on record/replay	B & C, Auto Tape Type, 3 Head, Infra Red Remote	R	52
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	Dolby B & C, Auto Azimuth Correction, Manual EQ and Bias, Auto Reverse		52
Onkyo TA 2130 £140	Average+ Average+	Rating fairly well on both pre-recorded and record/playback, ergonomics were a little poor but overall performance was generally consistent	B & C, Auto Tape Select, Intro Scan	R	52
Revox B215 £1461	Good Average+	Superb engineering and good sound, but lacking the subjective qualities that characterise the very best hi-fi equipment	Dolby B, C, Remote control, Headphones		52
Rotel RD-830 £99	Average- Poor	A pretty fundamental if slightly dated design with little sonic merit but an attractive enough price	Dolby B		52
SAE C102 £549	Average+ Good	Looking most unlike a cassette deck designed in the States and proving competitive in its price group. Not sonically that outstanding, however	Auto repeat, Track Skip, Real Time Counter, B & C, Auto Select	R	52
Sony TC-FX 150 £90	Average+ Average+	Recording and playing back on this deck itself gave acceptable results, whereas pre-recorded stuff was a joke. But it's a good £90 worth	Dolby B & C	BB	52
Sony (WMD6C) ProWalkman £249	Good+ Excellent	"One of the finest sounding cassette decks on the market today. A mandatory Best Buy, which also fits in your pocket".	Dolby B, C, Portable, Mic/Headphones	BB	52
Sony TC-K444E SII £349	Good Average	Even the best this deck has to offer is not truly commensurate with the price	Dolby B, C, Memory stop and replay, Headphones		52
Sony TC-K700ES £499	Excellent Excellent	Firmly in the esoteric league, this is easy both to operate and to listen to. Best points: first class imagery, focus and stability	Dolby B, C, Auto tape select, Memory/auto play, Bias/sensitivity adjust	R	52
Teac V-200 £80	Average- Average+	At this price you don't get fireworks, but it offers real value for money and sounds open and honest	Dolby B	R	52
Teac V-210C £99	Poor Poor	It could have been our sample but we found inadequate speed stability and a 'messy' sound	Dolby B, C, Bias adjust		52
Teac W300 £115	Poor Average-	Sonically a mixed blessing, it does well with pre-recorded tapes but home-made recordings sound a little rough	Twin-deck high speed dubbing, Dolby B		52
Teac W-310C £129	Average- Average-	Dubbing performance is poor, especially using the high speed mode but normal record and replay performance standards are not too bad	Dolby B, C, Twin transports, bias adjust		52
Technics RS-B305 £140	Good+ Excellent	Well built and offering excellent sound quality at the price, working well with metal tapes if not so hot on pre-recorded material	Dolby B & C, dbx	BB	52
Technics RS-T22 £150	Excellent Average	Good value for a twin deck machine, and fairly simple to use, but sonically no competition for single transport machines	Twin, Dolby B & C High Speed Dub.		52
Technics RS-B705 £250	Average Average-	3 heads for the price of two, but not the sound quality to go with them	3 head, Dolby B & C & HX Pro		52
Technics RS-T80R £400	Poor Poor	Flexible and pleasant to use but poor transports led to poor sound on our latest sample	Twin Deck Auto Rev, High Speed Dub, Auto Tape select, B & C & DBX		52
Yamaha KX-200 £140	Good- Good	Cheap, well-equipped and workmanlike with the sound quality less obviously processed than most - the whole is more than the sum of the parts	Dolby B, C, Headphones, Track search/scan, Optional remote	BB	52
Yamaha K-340 £160	Average Average	This deck doesn't make the grade on the grounds of poor speed stability, and an unwelcome degree of record level dependency	Dolby B, C, HX Pro, Auto search/scan, Optional remote control		52
Yamaha K222 £200	Poor Poor	Beautifully made, but it makes little sense in purist audio terms	High speed dubbing twin deck, Dolby B, C, Auto search, track sensing		52
Yamaha KX-400 £200	Good Good+	A highly commercial package with every widget under the sun. Happily it sounds good too.	Auto reverse, Dolby B, C, Hx pro, Track search/repeat remote control	R	52

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

DIRECTORY

CASSETTE DECKS

MODEL PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Yamaha K-540 £210	Average Average	Satisfactory but not especially satisfying, and also a bit gimmicky, it failed to match its brothers' good performance at the price ratings	Auto search/repeat, Dolby B, C, HX Pro, Bias adjust, Remote		52
Yamaha KX-1200 £500	Excellent Average+	A ventriloquist's nest of buttons and dials, albeit well laid-out. This is nearly a great recorder, but lacks simplicity of sound	Dolby B, C, HX Pro, Bias adjust, Auto search/repeat, Remote, headphones		52

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 V-9900X £750	Good Good	Refined up-market system with most modern features. Sound quality is good all round – even the speakers are acceptable.	Remote, timer, auto source select	R	54
Aiwa V15000X £999	Good Good	Remarkable features level even includes independent record feeds to each cassette. High class build, satisfying sound, but best without loudspeakers	Separates system, twin auto-reverse cassette, full remote, timer	R	54
Akai 990 £1400	Average Average+	A gadget oriented expensive system with good compact disc player and remarkable loudspeakers. Let down by the tuner and turntable and not helped by obscure ergonomics	Twin deck cassette, Auto rev., Remote Control, Auto source selection		Systems
Binatone Laser CD System 2000 £270	Bad Bad	A bit of a disaster even at the price. Built to extremely low standard with an appalling turntable. CD and loudspeakers OK, but let down by amp	Twin cassette		Systems
Ferguson HF03 £400	Average+ Good	An all round success with British built speakers and all sources achieving a reasonable standard. Compact disc was weak compared to other units	Twin cassette	BB	Systems
Fidelity MS202 £340	Bad Bad-	Very cheap and poorly finished. Thin, raw sound to match appearance and build	Twin cassette, one-piece system		54
Fisher Midi System M46CD £500	Average Average	Somewhat overpriced, the M46 is let down by a poor amplifier and worse speakers. Other elements perform reasonably, CD being its strongest point	Twin transport		Systems
Fisher Midi System M56CD £580	Average Average	Fitted with a pretty good amp, but dire loudspeakers; otherwise a competent combination including a pretty fair cassette deck	Twin cassette, 5-band graphic Equaliser		Systems
Fisher 2400 £600	Average Average	An ambitious and competent package with a strong amplifier and CD player. Given its new lower price it would have merited recommendation if the loudspeakers hadn't let it down	Twin deck, Graphic eq, 5-band		Systems
Goodmans 5100 £380	Poor- Bad	A combined electronics package, with performance standards only too typical of the breed. Speakers good for type but don't compensate	Twin cassette, one-piece system		54
Goodmans 5200 £459	Average+ Average+	Offering possibly the best speakers around in this midi system market, the Goodmans wins on a fair standard for the price, though the turntable was not too hot	12 Band Graphic Eq, Twin deck	BB	Systems
Goodmans Maxim-Midi System £550	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
Hitachi MD280 £430	Average- Average-	Although the CD player tried to change our mind this system was felt too poor a contender for anything but thumbs down	Remote unit TT, twin cassette, no spare inputs		54
Marantz Studio System £449	Average+ Good	More a hi-fi system than a true midi package, it's good if uninspired. A stronger amplifier could help	Only amp, CD, & speakers – rest optional	R	54
Marantz Concert System £649	Good+ Good+	Well matched and achieved high fidelity standards. Strong characterisation with some treble loss – this wasn't quite neutral, but a pleasure to listen to	Only amp, CD & speakers – rest optional	BB	54
Marantz MX673CD System £999	Average+ Average	Tremendously flexible audio/visual system. Sound quality is satisfactory at best and ergonomics a mess	Various A/V inputs, remote, speakers optional	R	54
Mitsubishi CD51 £429	Average Average-	In some ways a well balanced system, in that the amp and speakers smooth the rougher edges of some sources, but not very satisfactory on the whole	Remote, twin deck		Systems
Mitsubishi E602CD £500	Poor- Poor-	Totem-pole aesthetics match the mixed constructional quality. Sound quality is already poor, but featured synthesised bass can make matters worse still	Spare in/output set, twin cassette		54
Mitsubishi 100R £650	Average Average+	A pretty good package, flawed by 'tinny' loudspeakers, but having a fair turntable – a rarity in this category of equipment	Remote, Multidisc CD, Twin	R	Systems
Philips FCD 565 £370	Poor Poor	An unimpressive system. While the compact disc player and tuner were OK, its main tonal characteristic on all sources was a coarse top end	Double deck, 5 band graphic eq.		Systems
Pioneer S-7000 £478	Average+ Average+	Excellent beer-budget system that really works, with the exception of wobbly sounding cassette	One piece + (optional) CD and speakers	R	54
Pioneer System 10 £678	Average Average-	Loudspeakers sound cluttered, and cassette unstable and thin, but tuner and CD are fine	All separates, twin cassette		54
Pioneer System 30 £978	Average+ Average+	Odd remote system means two handsets. CD and radio work well, but turntable and cassette weak. Expensive	Remote, separates, twin auto reverse, multi-disc CD	R	54
Sanyo W40CD £380	Average Average	Low cost, no options package with attractive displays, cassette had high wow and flutter, but the rest worked OK	Semi auto T/T, auto record start, twin cassette	R	54
Sanyo W36 £550	Average Average	For a change, this outfit comes with excellent loudspeakers and CD player. The main weakness seems to be the amplifier but the turntable was OK, if not fab!	Two H/phone, 5 band graphic, twin deck cass.	BB	Systems
Sharp SA-CD800H £800	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 310 £450	Average+ Average+	Low cost but well built and finished and better sounding than most at the price	Remote, auto T/T, twin cassette	BB	54
Sony Compact 510 £599	Average+ Average+	Very good control layout. Shabby loudspeakers not up to otherwise uniformly good system	Remote, twin cassette	R	54
Sony Compact 610 £700	Average Average-	Inconsistent. Same turntable used in much cheaper Sonys gave 'iffy' record reproduction. Cassette likewise	Remote, 'shuffle' play CD, twin cassette		54

THE WORLD'S NO 1 GUIDE TO BUYING HI-FI

DIRECTORY

CD MIDI SYSTEMS

NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Sony FH1215CD £800	Average Average+	Probably the ultimate miniature system. The CD player is particularly good. Best to chuck the speakers away though	Miniature, transportable (AC only). Single auto-reverse cassette	R	54
Sony Compact 710 £999	Good Good	Typically well built and presented but complicated to use except via remote. Record deck poor but remainder good, including speakers	Full remote, auto T/T, twin auto reverse cassette	R	54
Sony Compact Series 90 £1500	Good Good+	The best of a not too wonderful bunch, the excellent compact disc player and pretty good speakers make for reasonable sound quality, though the tuner wasn't quite the same standard	Twin deck, auto reverse, timer, extra tape socket	BB	Systems
Technics X800CD £400	Average+ Good (cass poor)	Very unstable sounding cassette lets system down badly. Tuner a bit dull, but remainder OK	No T/T, twin cassette		54
Technics X820 £580	Average Average	Tuner and CD player work well but the speakers sound ragged	Remote, auto record starts		54
Technics X840 £730	Good Good	Expensive, but well made, good sounding system. Turntable, tuner & CD player similar to X820	Full remote separates system	R	54
Technics X880 £900	Average+ Average+	Complex, high spec unit with good performance except for the indifferent speakers, which are completely out of keeping	Remote, auto source selection, programmable T/T		54
Toshiba V17CD £399	Average Average+	Loudspeakers are the weak link, with cassette and turntable also indifferent. Tuner and CD worked well though, so reasonable value for money	Twin cassette, semi-auto T/T	R	54

PERSONAL STEREO

Whilst not exactly hi-fi components, personal stereos probably play more music to more ears than CDs and LPs combined and as such should not be ignored. Since the introduction of the Sony Walkman in the early eighties, more and more people have adopted these diminutive machines and consequently the market has become saturated with a vast assortment of players. This is obviously good for competitive pricing but bewildering if one is trying to select a reasonable machine. Prices start incredibly low (around £10) and wind themselves up

to close on £300, although the sub-£50 sector is the most popular.

There seems to be almost no end to the features that appear on personalis; some of them have specifications like a midi system! Graphic equalisers are very popular, for what they're worth, and Dolby is fairly common on the £40 plus models, though the quality of noise reduction systems seems to be pretty poor. You can expect more useful features such as autoreverse and ferric/chrome-metal tape compatibility on many machines and

some even record, but usually only from a microphone or built in radio where it exists.

The sound quality available tends, not surprisingly, to increase with the price of the machines but even quite expensive players are prone to wow with critical material, so if classical piano music is your bag then steer clear of the cheaper (sub £50) players.

Note that our value judgements relate to the personalis group as a whole, and are not comparable with separate hi-fi ratings.

MODEL NAME PRICE	LAB SOUND	COMMENTS	FEATURES	VALUE	BACK ISSUE FULL REVIEW
Aiwa HS-G35 MkII £35	Poor Fair	A reasonable player for the price but not well suited to classical material and let down by the headphones	Autoreverse, graphic EQ, types I & II		This
Aiwa HS-J36 £89	Good— Average	Comprehensive facilities and reasonable sound are no mean feat for the price.	Dolby, autoreverse, types I, II & IV, AM/FM, recorder	R	This
Aiwa HS-PX101 £149	Average— Good	A very slick little number with soft touch controls and remote control headphones	Dolby B, C, autoreverse, types I, II & IV	R	This
Aiwa HS-J101 £170	Poor Good—	Let down by cheap headphones, this is otherwise a quite nice machine with radio presets and electronic transport controls	Dolby, autoreverse, graphic EQ, tape types I, II & IV, AM/FM, recorder		This
Ferguson 3T46 £35	Very Poor Poor	Not particularly subtle but having reasonable speed constancy, it's OK with most material but can get painful	Autoreverse, AM/FM		This
JVC CX-7 £111	Poor Average+	Quite attractive and unusual in appearance, the CX-7 sounded pretty good and came close to recommendation	Dolby, autoreverse, types I, II & IV, rechargeable		This
JVC CX-87K £188.77	Poor Good	Maximum feature count from this expensive JVC, including soft touch record and stereo microphone. Sound quality, however, could be better for the price.	Dolby, autoreverse, types I, II & IV, AM/FM, record, rechargeable		This
Panasonic RX-SA78 £100	Very Poor Fair	Not particularly good value with poor speed stability and irritating hiss levels, the latter can be improved with better headphones	Autoreverse, graphic EQ, AM/FM		This
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		This
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		This
Sanyo MGR-77 £35	Very Poor Very Poor	Rather a basic machine with a raw edgy sound, not helped by poor speed stability	Graphic EQ, AM/FM		This
Sanyo MGR-87 £50	Very Poor Fair	The 87 came up with a slightly fast but rhythmic sound. Although lacking in finesse, it worked OK with pop material	Autoreverse, graphic EQ, AM/FM		This
Sanyo MGP 600D £50	Average+ Average—	With styling aimed at the fairer sex the 600D sounded a little better than the similarly priced MGR-87. Lacking in clarity, it was still quite endurable	Dolby, autoreverse, graphic EQ, types I, II & IV		This
Sanyo JJ-P4 £100	Poor Good	Claimed by its makers to be the world's smallest personal stereo the JJ-P4 is a tasty looking object that's capable of good sounds to boot	Dolby, autoreverse, tape types I, II & IV, rechargeable		This
Sony WM-34 £40	Poor Average	This straightforward no frills Walkman makes pretty plausible sounds at a reasonable price and apart from the Walkman Pro was the only model to earn a Best Buy rating	Dolby, types I, II & IV	BB	This
Sony WM-F38 £70	Average— Average	A quite stylish player, the F38 delivered good performance for the price and also had reasonable headphones	Dolby, types I, II & IV, AM/FM	R	This
Sony WM-F63 £100	Average— Average—	This attractive Sports Walkman is nicely built but sonically flawed by rather hissy intra-aural headphones	Dolby, autoreverse, types I, II & IV		This
Sony Walkman Pro £249-£289	Good+ Excellent	One of the finest sounding cassette decks on the market today. A mandatory Best Buy, it takes other personalis to the cleaners (except on weight and power consumption)	Dolby B, C, types I, II & IV, record, line in/out, varispeed	BB	This/52
Toshiba KT-4027 £35	Very Poor Very Poor	Not a very wonderful machine, the 4027 sounded pretty appalling with all but the most unobtrusive music	Graphic EQ, AM/FM		This
Toshiba KT-4047 £60	Average Average	This model proved capable of making the most of better recordings, and sounds reasonably tuneful	Dolby, autoreverse, graphic EQ, types I & II, AM/FM	R	This

TO ORDER BACK ISSUES OF HI-FI CHOICE SEE PAGE 60



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 combination 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 distin-

guish the loudspeaker unit itself, be it bass, mid-range, 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 70 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 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 musical 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.

MULTIPLEX FILTER (MPX): A circuit which introduces severe attenuation at supersonic frequencies to decrease interference encountered with the output from some stereo FM tuners.

NANO (n): Prefix meaning a thousandth of a millionth of.

NOISE: Random unwanted low level signals.

NOISE MODULATION: An unwelcome breathing effect that can be heard on some programme material, produced by poor noise reduction systems, or circuits.

OCTAVE: Two-to-one ratio of pitch or frequency.

OFFSET ANGLE: The angle measured between the centre line of the pickup cartridge and the line which joins stylus and arm pivot point.

OHM: Unit of electrical impedance (including reactance) or resistance; also kohm, where 1 kohm = 1,000 ohms.

OVERHANG: The extent to which the cartridge stylus extends beyond the centre of the platter is critical, and controlled by fore and aft adjustment of the cartridge on the arm.

PASSIVE: The most common type of system, where drivers and crossover are driven from a single power amplifier.

PEAK RECORDING LEVEL: A level above which distortion becomes apparent. This distortion is introduced when the oxide particles almost reach magnetic saturation, and thus will accept no more level.

PHONO: The most commonly used plug/socket combination in audio components.

PICO (p): Prefix meaning one millionth of a millionth of.

PORT: An opening in a cabinet which is tuned to characteristics of the bass driver and the enclosure volume to provide reflex type bass-loading.

POWER AMPLIFIER: The part of an amplifier that provides power to drive the loudspeakers: usually integrated, it is sometimes a separate component.

PRE-AMPLIFIER: The part of an amplifier that accepts the input signals, sorts them, applies any necessary equalisation, and then passes the signal to the (normally integral) power amplifiers.

PRESENCE: A quality of forwardness or immediacy in a sound balance, generally related to an upper-middle frequency response boost.

PRINT-THROUGH: A pre- or post-echo of a loud signal created by magnetisation occurring from one layer to an adjacent layer after the tape has spooled or been recorded.

Q: A measure of the magnitude and shape of a resonance; the higher the Q, the sharper and more severe in amplitude the resonance.

REFLEX: A system of bass loading (using port or ABR) which offers improved efficiency and bass

power handling at the expense of subsonic control compared to a sealed box.

RUMBLE: The low or medium frequency sound produced mechanically by any moving parts in a turntable, mainly the motor and platter bearings.

SENSITIVITY: The volume of sound output for a specific electrical voltage input.

SEPARATION: As between the two channels of a stereo pickup; see *crosstalk*.

SHIBATA: A special stylus extending the elliptical to a 'line-contact' type of profile.

SIDE-THRUST: A force acting on cartridges in pivoted (ie not parallel tracking) arms, due to the stylus/vinyl 'friction' acting along the line of the offset angle; hence bias or side-thrust compensation.

SIGNAL-TO-NOISE, SIGNAL/NOISE, S/N: The difference in total output when an applied signal is removed.

STYLUS: The specially shaped piece of diamond in contact with the groove and connected to the cantilever.

SUBSONIC: Below the audible range, ie below 20Hz.

SQUARE WAVE: A signal which consists of a fundamental plus a (theoretically infinite) series of odd (3rd, 5th etc) harmonics in a precise phase and amplitude relationship. It is useful for examining transient performance, symmetry, resonance control and 'ringing'.

THD: Total harmonic distortion.

TRACING: The following of the groove modulations by the stylus; hence for example tracing distortion, caused by the inability of a spherical stylus to trace the high frequency inner grooves on a disc.

TRACKABILITY: The ability of the 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 motion of the stylus is set with respect to the vertical when viewed from a side elevation of the cartridge. Should match the 20° cutter standard.

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

WOOFER: A drive unit that operates over the bass portion of the audio range.

WOW AND FLUTTER: Low and high frequency pitch variations (from poor tape transport of turntable platters with speed drift).

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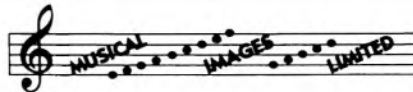
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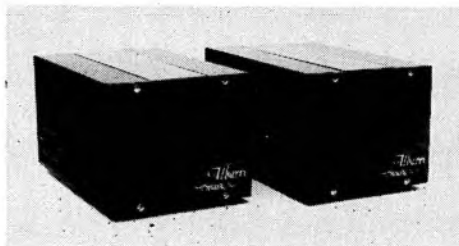


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REVIEW PRODUCT INDEX

AMPLIFIERS

A&R ARCAM ALPHA	39
ALBARRY M408 II	40
AUDIOLAB 8000A	41
CAMBRIDGE AUDIO P40	42
CREEK CAS 4140	43
CREEK CAS 4040	45
DBX CX3/DX3	46
DENON PMA 250	47
HARMAN KARDON PM640VXI	48
HARMAN KARDON PM655VXI	49
HITACHI HA007	50
INCATECH DIRK	51
INCATECH CLAYMORE	53
KENWOOD KA550	54
LUXMAN LV100	55
MARANTZ PM35	57
MERIDIAN 201/205	58
MUSICAL FIDELITY A1	59
MUSICAL FIDELITY B200	61
MUSICAL FIDELITY A100	62
MUSICAL FIDELITY PREAMP 3B/P140	63
NAD 3020E	64
NAKAMICHI CA7E/PA7E	65
NIKKO NA700	66
ORELL SA-040	67
PHILIPS FA860	69
PHILIPS FA960	70
PIONEER A331	71

QED A240SAII/A240CDII	72
REVOX B250	73
ROTEL RA820A	75
ROTEL RC850/RB850	76
ROTEL RA870BX	77
SANSUI AUG11X	80
TECHNICS SUV55A	81
TECHNICS SUV85A	82
YAMAHA AX300	83
YAMAHA AX500	84
YBA 2 PRE/POWER	85

CASSETTE TAPES

TYPE I FERRICS

AGFA F-DX1	93
AGFA F-DX1S	93
BOOTS FERRIC I	93
BOOTS SUPER FERRIC I	93
DENON DX	93
FUJI FR-IS	93
FUJI DR	95
GOLDSTAR HD	95
GOLDSTAR HR	95
JVC UF1	95
MAXELL UDI	95
MAXELL XLI	95
MAXELL XLI-S	97
MEMOREX dBS	97
MEMOREX dBSI	97
MEMOREX MRXIS	97
REALISTIC LOW NOISE	97

REALISTIC GOLD PLUS	97
SONY HF	99
SONY HF-S	99
SONY HF-ES	99
TDK AD	99
TDK AD-X	99
THAT'S FX	99
THAT'S TX	101
TYPE II CHROMES	
AGFA CDXII	101
AGFA CDXIS	101
FUJI FR-II	101
FUJI FR-II SUPER	101
JVC UFII	102
MAXELL UDII	102
MAXELL XLII	102
MAXELL XLII-S	102
MEMOREX HBXII	102
MEMOREX CDXII	102
MEMOREX CRXII	104
SONY UX-ES	104
SONY UX-PRO	104
SONY UX-S	104
TDK SF	104
TDK SA	104
TDK SA-X	106
THAT'S EX	106
THAT'S EM-X	106
THAT'S VX	106
TYPE IV METALS	
FUJI FR METAL	106

MAXELL MX	106
SONY ES	108
TDK MA-X	108
TDK MA-XG	108
THAT'S MG-X	108
THAT'S MR-X PRO	108

PERSONAL STEREO

AIWA HS-G35MKII	115
AIWA HS-J36	115
AIWA HS-PX101	116
AIWA J101	116
FERGUSON 3T46	117
JVC CX-7	117
JVC CX-R7	119
PANASONIC RX-SA78	119
PHILIPS D6658	120
SAISHO PS90R	120
SANYO MGR-77	121
SANYO MGR-87	121
SANYO MGP 600D	123
SANYO JJ-P4	123
SONY WM-34	125
SONY WM-38	125
SONY WM-F63	126
SONY WALKMAN PRO	126
TOSHIBA KT-4027	127
TOSHIBA KT-4047	127

ADVERTISERS INDEX

ABBOTT AUDIO	144	MISSION	08C
ACOUSTIC GOLD	52	MORDAUNT-SHORT	148
ACTIVE AUDIO	150	MURRAY HI-FI	154
ALTERNATIVE AUDIO	146	MUSICAL FIDELITY	14
APPOLO SPEAKER STANDS	96	MUSIC ROOM	140
A&R CAMBRIDGE	32	NAD	128
ARISTON	1	NAIM AUDIO	IFC
ASHTON AUDIO	154	NAKAMICHI	114
ASTON AUDIO	113	NIKKO AUDIO	16
ATLABS	92/94	O'BRIEN HI-FI	109
AUDIO CONCEPT	166	ORELL ACOUSTICS	11
AUDIO FILE	146	ORTOFON	12/13
AUDIO INSIGHT	152	PAUL ROBERTS	129
AUDIOKITS	96	PIONEER	IBC
AUDIO PROJECTS	168	PRECISION AUDIO	109
AUDIO TECHNICA	100	QED	44
BARTLETTS	74	RADLETT AUDIO	148
BEYER DYNAMIC	90	RAYLEIGH HI-FI	136
BRENTWOODS	154	RICHER SOUNDS	103/105
CAMBRIDGE AUDIO	56	ROGERS SWISSTONE	14
CAMBRIDGE HI-FI	146	ROTEL	36/38
THE CHORD COMPANY	86	SEVENOAKS	78/79
THE CORNFLAKE SHOP	34	SONY UK	107
COVENT GARDEN RECORDS	133	SONY TAPE	24
CREEK AUDIO	89	SOUND ADVICE	96
CRITICAL AUDIENCE	148	SOUNDTECADC	122
DOUG BRADY HI-FI	124	SOUND GALLERY	144
FBA	167	STEVE BOXSHALL	124
FREETIME AUDIO	144	STANDENS	132
HAMPSHIRE AUDIO	98	SUBJECTIVE AUDIO	110
HEYBROOK	76	SUSSEX AUDIO	156
HI-FI EXPERIENCE	118	SWIFTS OF WILMSLOW	142
IN HI-FI	156	TDK	10
JEFFRIES	150	TECHNICS	4/5
KEITH HUNT	109	THAT'S TAPE	112
LINX AUDIO	86	WEST MIDLANDS AUDIO	152
MARANTZ	6	WOODSIDE ELECTRONICS	152
MAXELL	22	ZEUS AUDIO	132

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