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HI-FI CHOICE No. 44
Amplifiers & Stereo Tuners

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Jonathan Kettle, New Hi-Fi Sound, July 1985

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Ian Kuah, Which Compact Disc? September 1985.

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Hi-Fi News. October 1985.

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Alvin Gold. New Hi-Fi Sound. February 1985

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Ken Kessler, Hi-Fi News. May 1985.

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SANSUI TU-D 99X. Best Buy, Hi-Fi Choice. March 1985.
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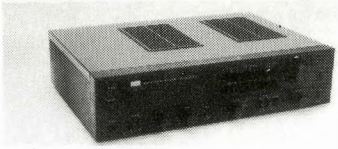

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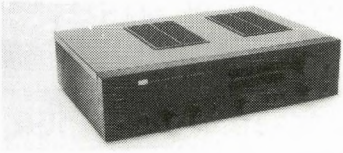

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This introduction explains what the amplifier does, inputs, facilities and features, what to look for in performance terms and when matching an amplifier to other parts of the system.

The arrival of Compact Disc has if anything added force to the old truism 'The amplifier is the heart of the system'. Like hearts, amplifiers are often described as 'hard' or 'soft', 'fast' or 'slow'. While some are robust enough for a lifetime of hard work, others tend to give way under stress — and there is no doubt that modern life with CD can be more demanding of amplifiers!

What an amplifier does

A hi-fi pickup cartridge is just one of a number of devices (others include microphones, tape heads, radio tuners and the output stages of CD players) which produce tiny alternating electrical currents whose waveforms represent the waveforms of musical sounds. Just as the pickup cartridge or microphone is a kind of electrical generator, converting a mechanical energy input into electrical output, the loudspeaker is really a very specialised kind of electric motor, which makes use of electric power to produce vibrations in the air, which we hear as sound. An audio amplifier takes small electrical signals and amplifies or enlarges them enough to drive loudspeakers.

The several stages of amplification needed to connect a record deck (for example) to a loudspeaker may be all contained in one box — the familiar integrated amplifier. Or they may be logically separated into two units, each fed from their own mains power supply transformer — the pre-amplifier and the power amplifier.

Pre-amplifiers and power amplifiers

Sometimes called a control unit or control amplifier, the pre-amplifier is designed to take the small voltages of the various signal sources, which in the case of moving-coil cartridges may be as little as a few microvolts, and raise them to a roughly standardised level of about one volt, known as 'line level', which is convenient for switching and routing them to the power amplifier, or to 'record' outputs for connection to a cassette deck. The signal can also be modified at this stage by tone controls or filters.

In practice, many of the devices which provide sound sources also incorporate voltage amplification up to 'line level' — CD players, cassette decks and tuners all do — and here the pre-amplifier's function is mainly to provide control over volume, balance and (if desired) tone.

The power amplifier once again enlarges the voltage applied to it — but it also needs to be able to provide current. Voltage and current can be simply explained by the 'water analogy', in which you can compare an electrical circuit to a system of plumbing. Voltage (or 'potential' between two points) means electrical pressure — like the pressure of water behind the tap. Current (measured in amperes or amps) means the actual flow of electricity when the connection is made — what happens when the tap is opened. To continue the analogy, a nearly-closed tap represents a high electrical resistance — the pressure (voltage) may be high, but little water (current) actually flows. When the tap is opened wide, there may be enough water to keep the flow going without losing pressure — but if there is an inadequate supply, the pressure will drop. So if an amplifier is not able to keep as much current (that is 'quantity' of electricity) flowing as the loudspeaker demands, the voltage (or 'pressure') will drop. When this happens, the amplifier is no longer driving the loudspeaker properly.

Disc input

The pickup cartridge or disc input stage of the amplifier obviously should be designed around the kind of signals it receives from the cartridge. Until fairly recently, almost all cartridges were of the *moving-magnet* type with a typical output level of 1mV/cm/sec, this definition relating voltage output to groove velocity on the record (the term 'moving-magnet' or 'mm' is used to cover cartridges more accurately described as 'moving-iron', 'induced magnet' and so on, as well). Although some mm cartridges do produce measurably more output than others, the difference is not great enough to produce problems for a well-designed amplifier disc input stage.

When discs are mastered in the cutting studio, a standard amount of equalisation, taking the form of a bass cut and treble boost, is applied so as to get the maximum dynamic range onto the record while keeping the size of the groove excursions within reasonable limits (without this, loud bass notes would produce unacceptably large 'wiggles' in the groove, which would both limit the playing time available and present problems for the cartridge on replay).

Because of this pre-emphasis at the recording stage, the disc amplifier stage on replay must perform a compensating de-emphasis — effectively a bass boost and treble cut — to bring things back to normal. This compensation is called *RIAA equalisation*, and is built into the disc input circuitry of every amplifier. The standard

curve for RIAA equalisation should be followed to very close limits by the amplifier designer — experience shows that even quite small deviations from the RIAA specification, giving small amounts of treble boost or cut to the final frequency balance of the hi-fi system, can have surprising results on the subjectively-perceived overall sound quality. Many designers now 'tailor' the RIAA somewhat to achieve the desired result.

Moving-coil disc input
Typical moving-coil type cartridges produce much power voltage outputs than moving-magnet ones — in the order of a few hundred microvolts (μV) rather than a few millivolts. For this reason they need a special input of greater sensitivity, or, to put it another way, the input needs to have about 20dB more gain. There are some 'high-output' moving-coils that will work satisfactorily into a moving-magnet input, but these are a minority.

Compact Disc or auxiliary input
Compact Disc has at last provided a role for the previously seldom-used 'aux' or auxiliary sockets, which are now often labelled CD. The input's electrical specification is the same as for tape and tuner inputs, but many manufacturers have taken some extra care to make sure that the electronics here are of high enough standard to do justice to the medium in terms of low noise and stereo separation. The extra dynamic range of CD mainly requires a more capable power amplifier stage though.

Tape inputs and outputs
Connections between a cassette recorder and the amplifier must not only allow replay of tapes through the system, but must also allow the cassette deck to record from any of the other signal sources, such as CD, tuner or disc. Most amplifiers and virtually all cassette decks now use the standard RCA 'phono' sockets for tape input ('play') and outputs ('record'), and compatibility problems should be almost a thing of the past. Some British amplifier manufacturers use five pin DIN sockets for tape input/output, but these are virtually always wired to phono-level standards — not to the intended DIN levels at all. This means that a DIN-to-four-phonos lead should connect the cassette deck correctly, with no level matching problems. Ironically, you are only likely to have problems connecting a British amplifier's DIN socket to an older European cassette deck whose DIN socket is actually to the DIN standard! Conversely, where Japanese cassette decks were fitted with DIN sockets, these were usually 'phono' level too. If doubt or distortion should arise, your dealer will be able to sort things out for you.

Tape-to-tape dubbing
Many amplifiers offer 'tape dubbing' or 'tape copy' switches, which are designed to allow you to make copies of cassette tapes by using a second cassette recorder connected to the 'tape 2' sockets. If you intend to do a lot of copying this facility may be worthwhile, but otherwise note that you can in fact produce tape copies using any amplifier that has an 'aux' (or even 'tuner') input by feeding the output of a second cassette deck to this and then recording on to a cassette deck connected in the normal way by setting the source selector to 'aux'.

Tone controls
Which controls are essential and which are merely unnecessary extras is always a matter for debate. A number of manufacturers now unhesitatingly adopt the so-called 'straight-line' design approach, the idea being that the signal path through the amplifier should be as direct as possible, and it should not be routed through convoluted tone control circuitry or switch contacts. Few people these days would argue with the basic common sense of this approach, which is simply trying to avoid including in the amplifier any components which inherently degrade the sound. On the other hand, it is not safe to assume that amplifiers with tone controls sound worse than those without, because this certainly is not always the case!

Power supplies
In discussing the ability of the amplifier to drive loudspeakers we have really been looking at the abilities of the power supply — transformer, rectifier and reservoir capacitors — to provide power when demanded. The amplifier output devices are there to control the flow and make it resemble the musical waveform.

Even where the power supply is quite 'beefy', the current instantly available on demand may be limited by *protection circuits* which are there to save the output devices from overload. These represent a reliable alternative to fuses, which in some circumstances may not blow as quickly as the transistors they are meant to protect! While protection circuitry can make an amplifier virtually indestructable, well-designed amplifiers should stand up to a fair amount of abuse.

On the basis that current drawn by one signal channel will affect that available at the same

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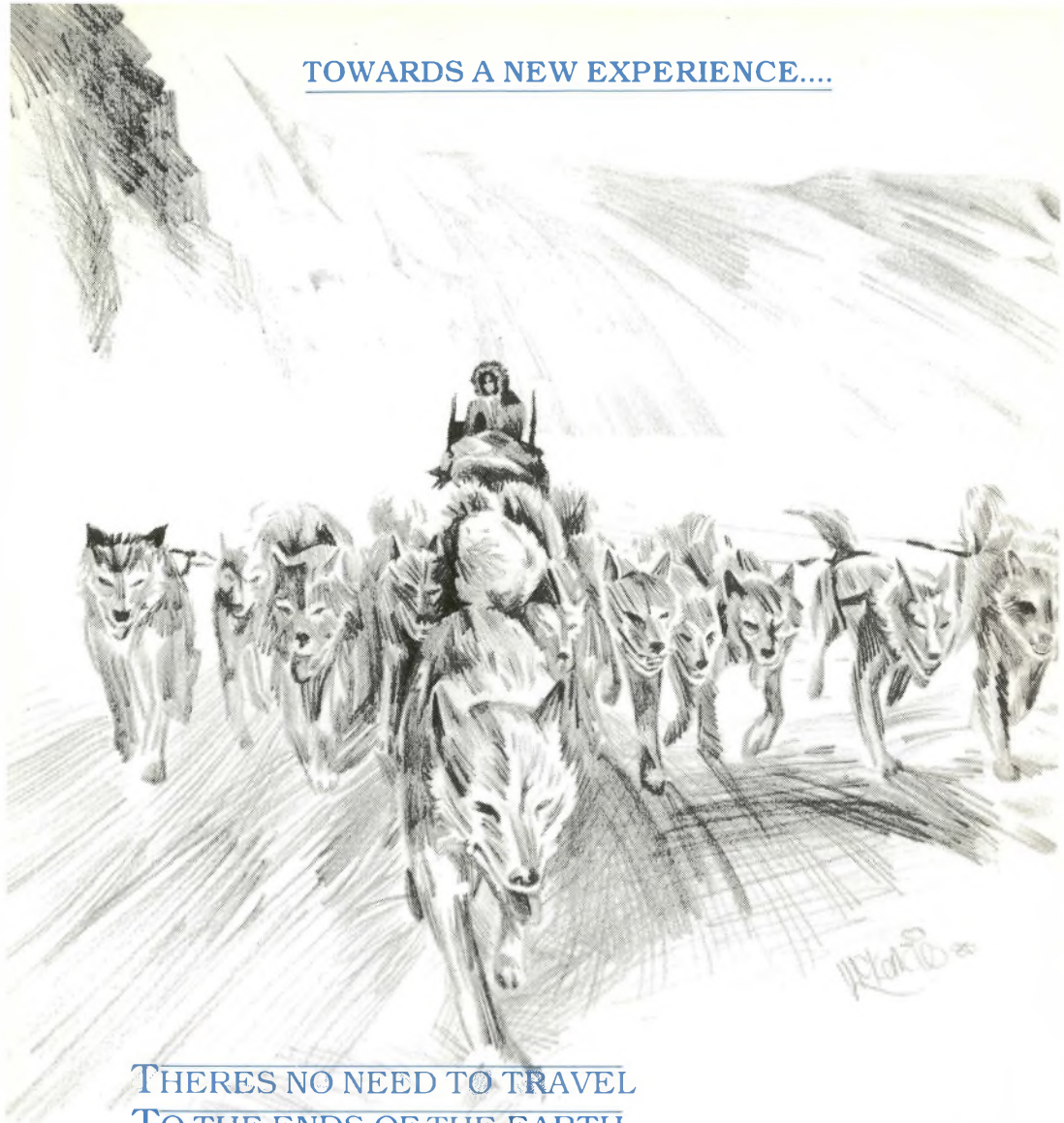

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Compact Disc Review. Jan 1986

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instant for the other, it would appear to be a good idea to have completely separate power supplies for the two stereo channels. The disadvantage, of course, is the added cost, bearing in mind that the power supply is the most expensive part of the amplifier anyway.

Another approach is to *regulate* a single power supply, that is, to control its output to the two channels by electronic means.

Amplifier/speaker matching

In practice, it is not very likely that you will end up with too much power. It is a fact that loudspeakers are far more often damaged by an underpowered amplifier than by an 'overpowered' one. This is because of the phenomenon of clipping, when at the limit of its power capability the amplifier can no longer stretch to the peaks of the signal waveform. Instead, it produces an output with the tops of the waveform 'clipped' off at the point where the amplifier runs out of volts. This means that most of the amplifier's power is going into the production of distortion harmonics, which are of high enough frequency to get into the speaker's treble unit and may well burn it out. Even on fairly large speakers, the tweeter alone may not be designed to handle, say, 20W continuous input, because normal music programme would not demand this.

So what is the minimum power you can get away with? Again one factor in the equation will be how well the amp behaves when it is giving almost its maximum output and begins to clip. But the most important considerations will be how loud you like to play music, how large the listening room is, and how sensitive the loudspeakers are. The first will depend on personal taste, and the second on circumstances, but we may as well consider an average room of say 80 cubic metres, while the third can have the most marked effect of all. Amongst the loudspeakers in one of our surveys there was a difference of rather more than 10:1 in the amplifier power needed to achieve the same level of loudness! So if you have very sensitive speakers, you should be able to get loud levels in a normal sized room using only a few watts of amplifier power, while the less sensitive designs may need as many as 40W to achieve a similar level; this in turn means that the less efficient speakers will be working an amp rather harder, and will leave less in hand to cope with peaks (which can be much higher than the average power levels in music), 50W or so is likely to leave sufficient in hand for the 'average' situation, but if the speakers used are fairly sensitive, 20W may be ample. If you find even more powerful amplifiers of 100W or more beginning to strain and giving insufficient 'headroom', it is time to consider using more sensitive speakers: this will usually be a cheaper way of getting a higher loudness capability. Once again there is no substitute to listening to a combination for yourself to determine whether it is loud enough or tolerable at its higher levels; sheer numbers of 8ohm watts do not give a reliable indication of whether a combination will sound good at high levels.

Facilities and features obviously have to be considered when chosing an amplifier, to sort out which 'extras' are really going to be used. This boils down to philosophies; if you once begin to adopt the purist or 'straight-line' approach, you will be more concerned with getting the signal sources and speakers (and even the room) right in the first place rather than trying to correct their imperfections electronically. But it is worth checking to see that the elegantly simple controls of an 'audiophile' amplifier won't leave you without the convenient source switching you need.

Subjective sound quality

Finally, and of course in our view of overwhelming importance, is the question of actual sound quality which, experience shows, can sometimes be alarmingly independent of measured technical performance. The whole business of subjective sound quality in amplifiers is a very vexed question indeed, and although in this book we have tried to give clear assessments of our findings there is still plenty of room for interpretation. Amplifier sound quality differences may be subtle, but can be fundamental to musical enjoyment. We feel that ideally no hi-fi product should be sold without a demonstration, and that if at all possible customers should have the opportunity of comparing alternatives in the context of their own system, preferably in their own home. An amplifier, theoretically, can only reproduce what is fed into it, but some designers have learned how to produce subjectively better results with a little 'cheating' in terms of response tailoring; and this will work better in some systems than others.

A good dealer should be able to demonstrate an appropriate improvement if he tries to sell you a more expensive amplifier instead of a cheaper one. The main thing is to try to listen with a relaxed, open mind, and to be swayed by what you hear rather than anyone else's analysis or persuasion. A sympathetic and helpful dealer will allow you the time and facilities to do this.

Steve Harris

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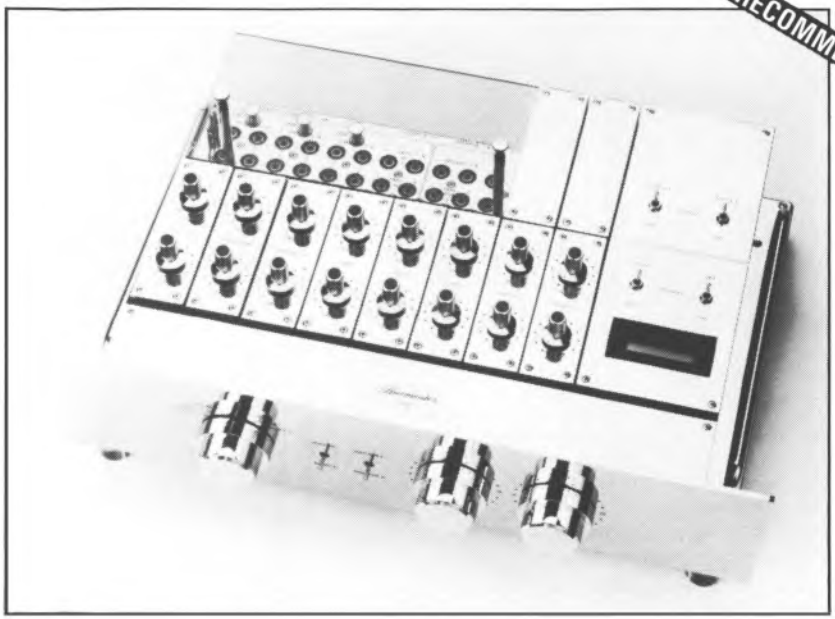

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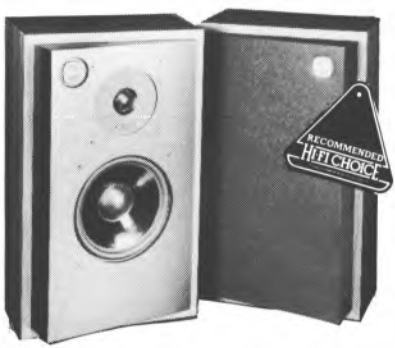

"... the speaker also showed a clear, open character with explicit detail, and a 'lively' nature." *HiFi Choice 1985*

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"... the sound of the Titan bears a strong family resemblance to the established 'Planet' models." *HiFi for Pleasure*

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TECHNICAL INTRODUCTION

In the test programme for this edition, comprehensive laboratory testing was combined with carefully-controlled listening tests. This Technical Introduction explains the methods and relevance of the various lab tests and the approach used in the subjective assessment.

In this section, the test procedure is covered in some detail, both as regards subjective and objective methods. Within the constraints of time and finance, these tests were designed to extract the maximum of useful information while at the same time verifying all basic aspects of measured performance, in order to ensure that the samples supplied were to specification and were not faulty.

Laboratory tests

In general the tests conform to the IHF A202 practice which makes comparison of the results between units straightforward. Where possible use has been made of dB rather than percent or linear scaling, which again makes comparison of product performance rather easier. For example, dB scaling of power output shows the subjective capability far better than linear watts ratings. For reference purposes, 0dB is set at 1 watt and the typical 100w amplifier output is thus 20dBW. The next higher power to give a worthwhile subjective power increase is 23dBW, 200 watts. While when quoted in watts this may seem a lot louder, in reality it isn't that much of an increase. Average amplifier outputs are around 17dBW (50W) which in fact is not a lot less in subjective terms than the levels produced by the 100W/20dBW models. It is worth remembering that 3dB is only a little greater than one notch on a typical volume control.

While power output may be the most often quoted specification for amplifiers, in fact it is not the most important. Indeed the test programme demonstrated that some 50W-specified models could get louder under real use conditions than some 120W-specified units.

With a typical loudspeaker of 88dB for 1W sensitivity, a 100W undistorted programme input will raise an in-room stereo sound level of around 102 to 104dBA, which is pretty loud. A 25W model will still achieve 98-100dBA, and more if allowed to clip occasionally, while a 250W model, assuming the speakers are able to tolerate it, will raise only 4dB more, giving 106-108dBA.

With modern speakers in average rooms, 30-60W is all that is required for decently musical maximum sound levels. A low sensitivity model such as the Celestion *SL6* (at 83dB for 1W) will need 100W plus for highish volumes, while those users who want the potential for really loud sounds will need a combination of 100W plus per channel and speaker sensitivity of 90dBW or more; alternatively, an active speaker system might give them what they desire, employing multiple power amplifiers to do this.

Output power and current

Output power is referred to output level on the basis of a good amplifier representing 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 addition of 3dB for 4ohms and a further 3dB for 2ohms only serves to confuse this fact. The reality of many of the more sophisticated 8ohm speakers is a complex and variable load impedance which can fall as low as 2ohms under dynamic music-related drive conditions. The matching amplifier is likely to have been purchased for its specified 8ohm output level, but we need to know how that level is sustained under possible real load variations.

Accordingly, the output level was examined for 8ohms, one channel, at less than 1% clipping distortion, as well as 4ohms both channels, and 2ohms pulsed, 20Hz to 20kHz. For pulsed and peak analysis a toneburst was used, consisting of 4 waveform cycles interspersed with 500mS rests.

In addition, peak output level readings for 8, 4, and 2ohms impedance are shown for comparative purposes. 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 logically must depend on the available power rating as well. Thus a small amplifier of up to 15dBW is unlikely to need more than ± 9 amps while for 20dBW (100W) model, ± 25A would be more appropriate. With really large amps of 23dBW and more, 35A

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JUNE

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AUGUST

LOUDSPEAKERS

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SEPTEMBER

BEST BUY GUIDE

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OCTOBER

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DECEMBER

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Searching comparison tests across the whole range of turntables and cartridges sort the myths from reality to discover which models and combinations really sound best — and find some low-cost 'Best Buys' that outperform many exotically-priced models. Plus guidance on matching and setting-up.

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would be regarded as a generous peak current capability.

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 at one channel driven, 8ohms, rated output and these tests provide a check on sample quality as well as 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 *HP3582a* sprectrum analyser with a resolution of 80dB. Where no products were visible the result is given as better than 80dB down. Via auxiliary input the peak composite input levels was 1V, via moving magnet 200mV, and via moving coil 20mV. These are strong signals but are within the normal expected dynamic range. For example, 50cm/sec peak disc modulation, 15kHz to 20kHz will typically raise 250mV peak from a moving magnet cartridge and 10-40mV from a moving coil model.

Supply modulation
A new test was adopted in 1985 to assess 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. Analyser resolution extends to −90dB relative to the fundamental.

Transient balance
Another test concerned the summation of an identical phase input at the amplifier's output terminals under 4ohm loading. The difference between the channels was then assessed. This test examines transient channel balance (auxiliary input). Due to production pressures this test could not be applied to all the review models.

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. A 1kHz reference frequency was used.

DC offset
This was measured with inputs and outputs terminated and when the equipment was well warmed up.

Input overloads
These are 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 and if it exceeded 20dB, for example 5V, a '>20dB' figure was given.

Channel separation
Using a sensitive B&K tracking filter, stereo channel separation was measured with the inputs terminated.

Output resistance (damping factor.)
At 0dBW a 2ohm load was applied and the drop in 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. A simple figure for the amplifier's resistance contribution is much easier to judge.

Disc sensitivity
This and the other sensitivities were measured using a computing 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 for a complete amplifier, to a 0dBW output.

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 over a 600ohms source resistance was computed to loading factor for 1kHz and 20kHz.

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Disc equalisation
For moving magnet this was measured using an *HP85* computer via reference to a look up table of exact RIAA equalisation values which were then used to plot the final curve. A 600ohm source impedance generator was employed, representative of a cartridge source; and hence where substantial input capacitance was present some high frequency loss would be experienced in the response, as would be the case with a real cartridge.

General appraised
In addition to normal lab test procedures — for example observation of distortion waveforms and so on — where practicable, the products were opened up for an engineering design appraisal as well as an assessment of safety and constructional quality.

Some of the test result figures in the review may cause readers some confusion if they are compared with manufacturers' specifications. With the latter, for example, the sensitivities are usually related to full output, but with IHF practice they are referred to a standard 1W (0dBW) output for all amplifiers, thereby allowing better comparisons to be made. A 100W (20dBW) amplifier with an 0.28mV IHF disc sensitivity will have a sensitivity figure of 2.8mV for full output.

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 100-plus models we auditioned, including the tuners. 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 in addition a number were monitored under blind conditions to ensure that the panelists were not subject to significant errors or indeed prejudice.

Key factors involved in arriving at satisfactory judgements included the author's personal experience of over 100 models over the past two years; the use of an acoustically controlled and neutral listening room; ancilliary 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 '3.0ohm' simulated speaker load. Peak programme power levels were monitored to subjectively assess the adverse load capability, as well. The dynamic possibilities of the larger amplifiers were also explored.

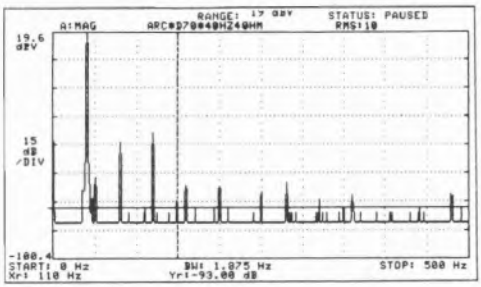
Where the pre- and power-amps from a given manufacturer could logically be separated, these were assessed as individual components, and if appropriate, individual ratings may appear in the conclusions.

The Celestion *SL600* loudspeakers were used for monitoring in a high proportion of the tests, but the Quad *ESL63* was also employed, especially with the better amplifier designs where its use in the home is more likely. Dynamic tests on the smaller amplifiers benefited from the use of the more sensitive Spendor *SP1*.

For auditioning the top class amplifiers, the Magneplanar MGIII II loudspeakers proved invaluable, due to their extended frequency response and high power capacity.

Great care was taken to ensure the high quality of the source material, this including the use of isolating platforms for the turntable and the CD units, as well as the optimum adjustment of the CD player and the use of balanced twin monocrystal interconnects, both for the sources, and, where desirable, for the pre/power amp combinations under test.

Less critical moving magnet disc auditioning employed a Technics *EPC 205IIIL* cartridge specially fitted to an SL7 turntable, but for the bulk of the tests, a Koetsu *Black* moving coil



Spectral analysis of power supply hum modulation and breakthrough. The 40Hz signal is at two-thirds rated power, 4ohm load, unless otherwise stated. This example is the Audio Research D70 II power amplifier.

was used, for both mm and mc inputs, with a high quality, low-ratio transformer where necessary. Rigid floor-coupled speaker stands with spiked feet aided evaluation, together with linear crystal cable.

The test programme comprised classical and popular material, chosen for its revealing qualities. The models were assessed for tonal neutrality, stereo image sharpness, as well as depth, ambience and width; musical transparency; bass definition and extension, treble sweetness and clarity as well as overall musical effect, and the amplifier's ability to 'involve' the listeners in the musical programme.

Equipment used in listening tests

Reference pre-amplifiers: Audio Research SP8 and SP10, Conrad Johnson Premier Three, PV5.
Reference power amplifiers: Audio Research D115 II, Conrad Johnson MV50, Quicksilver Mono, Robertson Forty-Ten.
Disc Inputs: Linn LP12, WTA, van den Hul MC10, Lux PD300, Zeta, van den Hul, Koetsu Red.
Aux inputs: Sony DA702 processor, CD552es deck, PCM701 process/mastertapes, Mission CD7000.
Loudspeakers: Quad ESL63, Spendor SP1, Magneplanar MGIII II, Celestion SL600; used with matching custom stands, floor bonded.
Location: Author's IEC listening room.
Listeners: Paul Crook, Neil Whitely-Bolton and the author.

Programme material

Compact disc:
Roxy Music: 'Flesh and Blood'
Dire Straits: 'Love Over Gold'
Dire Straits: 'Communique'
Bartok: Concerto for Orchestra (Solti)
Nimbus Records sampler
Ry Cooder: 'Bop Till You Drop'
James Newton Howard and Friends (Sheffield)
Respighi: Pines of Rome (Decca)
Phil Collins: 'Hello I Must Be Going'
Mahler: Symphony No 2, Slatkin (Telarc)
Analogue discs:
Rickie Lee Jones: 'Pirates'
'Dave Grusin Revisited' (Sheffield)
Ry Cooder: 'The Slide Area'
Berlioz Symphonie Fantastique (Reference Recordings)
Carol Kidd (Aloi Records)

Laboratory Test Equipment

For this issue, the new lab tests were carried out by the author using the following equipment:

HP 7025 digital vector plotter
HP3561A spectrum analyser
HP Thinkjet printer
Technics SH9000 series parametric equaliser
HP 3582A FFT
HP 8093 analyser
JP 9816 computer
Baxendall sweep oscillator
Rion LR04 level recorder
Hitachi 50MHz scope
Aim microprocessor RCL bridge
Exact pulse generator
Nicolet 444 computing analyser
Audio Lab test loads
B&K 4403 equaliser
B&K 2203 sound level meter
Technics peak programme meters
Wayne Kerr AMS1 multipurpose unit

Tests for earlier reviews which are reprinted in this issue were carried out by Camtech Ltd under the supervision of Stan Curtis, using the following equipment:

HP 8903A Analyser
HP 3314A Function Generator
HP 3590A Spectrum Analyser
HP 334A Analyser
Sound Tech 1700B Analyser
Gould 054040 Digital Storage Scope
Wavetek Sweep Generator
CSC Pulse Generator
Wayne Kerr B424 Automatic Bridge
B&K 2305B Recorder
J. J. Lloyd PL4 Plotters (two)
Thurbly & Fluke Precision Programmable DVMs
HP 85C Controller
Radiometer BKLF10 low-distortion Oscillator
B&K Tracking Multiplier 1901
B&K Band Pass Filter 2020 (two)

Acknowledgements

Thanks are due to Stan Curtis for his aid in the original test measurements for the earlier reviews and to Marianne Colloms who checked and typed the manuscripts. The author would also like to thank Paul Crook for his invaluable general assistance throughout the project.

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- Compact disc? ☐
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- £500-£1000? ☐
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- Ease of use/facilities? ☐
- Sound quality? ☐
- Size? ☐

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- Large – 401 + sq ft? ☐

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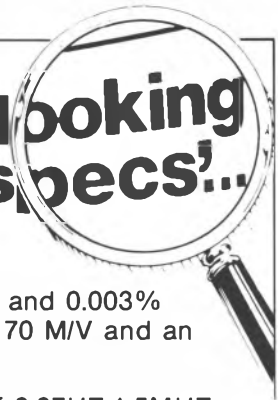

3008A Pre-amplifier with a S/N ratio of −95dB (IHF) and 0.003% distortion. The digital disc input has a sensitivity of 70 M/V and an overload rating of 20v.

3009A Power amplifier with a frequency response of 0.07HZ-1.5MHZ and pulse power capability of 1,500W into 0.5 ohms.

3001A Programmable FM Stereo tuner with a S/N ratio of −95dB in mono and −92dB in stereo.

3006A Stereo power amplifier with an output of 150W per channel into 8 ohms and a frequency response of 1HZ-150KHZ.

3011A Programmable FM stereo tuner. Budget version of the 3001A with similar specifications, e.g. useable sensitivity in mono is 0.85 micro volts.

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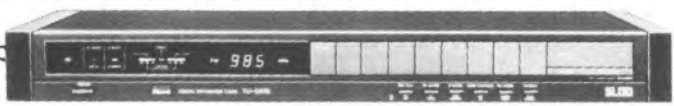

TU-D 99X TUNER £229 inc. vat. Best Buy, Hi-Fi Choice. March 1985.
"With a front rank sound quality and a very strong RF performance, this is clearly a fine tuner design. Suited, with the 'local' switch, to both fringe and high strength locations, a versatile performance is offered".
Conclusion. "The TU-D 99X represents very good value in its price sector, and qualifies for a Best Buy rating." *Hi-Fi Choice.*

PCV-100 COMPACT DISC PLAYER £259 inc. vat. "This player offers a good sound quality for the money, together with a competent transport, claiming fast access times. In common with other related models, the new PCV-100 has no difficulty in gaining a recommendation in this issue and in view of the latest pricing wins a 'Best Buy' rating." *Hi-Fi Choice. June 1985.*

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A&R Arcam Alpha

A&R Cambridge Ltd, Denny Industrial Centre, Waterbeach, Cambridge CB5 9PB
Tel (0223) 861550

Launched at the end of 1984 under the company's Arcam brand name (also used on their speakers), the distinctively styled *Alpha* represented A&R's first completely new integrated amplifier design since the introduction of the well-known *A60*, which was their first hi-fi product. Still very popular, the *A60* has now been in production for a decade and indeed A&R recently announced that total sales had now exceeded 25,000 units. The *A60* was actually reviewed (and recommended) in *Hi-Fi Choice* as early as 1977, but during its long production life, the design has undergone numerous internal improvements which helped it keep pace with the generally improving standards. The *A60* has also acquired a reputation for near-absolute reliability, something which regrettably cannot be said of all British-built products.

While the *A60*'s price has been held to £200, A&R perceived the need for a fully-equipped amplifier at a somewhat lower price. Seeing healthy sales at the budget end of the market, the A&R team developed the new model to sell at a target price level of £130, aiming to retain the by-now traditional virtues of the *A60*, including full facilities.

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 *Alpha* is all the stronger for this. Endowed with five inputs, including one moving magnet disc, the well-laid out controls include bass and treble. 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 ¼in socket on the front panel.

Inside, the construction quality is exemplary. The unit is built in a single board with clean, simple signal paths and optimised 'star' grounding. Internal wiring is virtually non existent. The output stage is complementary bi-polar direct coupled, and the earlier stages use high quality integrated circuits. Coupling components have been reduced to a minimum in order to maximise sound quality and some topgrade polypropylene capacitors have even been included.

Sound quality

We were impressed by the sound of this model, our views somewhat at variance with those of

RECOMMENDED

A&R themselves, since we rated the *Alpha* higher than the latest improved *A60*! Essentially neutral, the disc input sounded uniformly competent, well ordered in basic areas of stereo width and focus, frontal detail and general control. High frequency definition could have been better, while bass was a trifle 'soft'. It partnered inexpensive systems well and yet did not draw undue attention to itself in a more costly arrangement.

Via the CD input a mild improvement in clarity was noticed, while the overall effect was unstrained but with moderated dynamics.

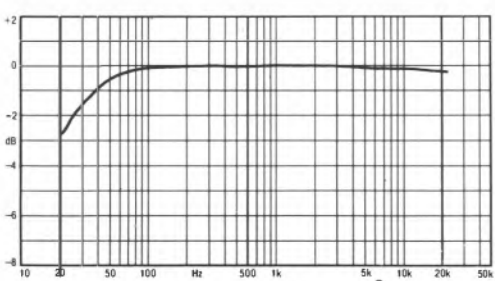
Lab results

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 supp'v modulation was respectable for the type, while all other aspects conformed to a well balanced competent design.

Conclusion

This well styled and built amplifier should work dependably in a wide range of systems, proving unobtrusive in amplifier terms. The overall compatibility was very good, and this coupled with the good standard for absolute sound quality assured this new Alpha a firm recommendation.



Disc input: RIAA equalisation accuracy

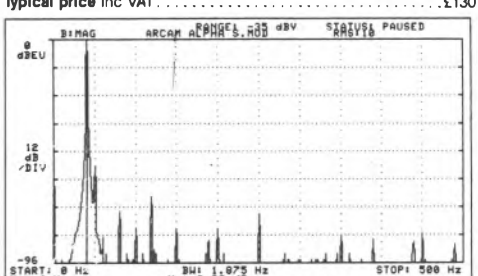
Test measurements

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			30W(=15dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.8dBW	16.2dBW	16.0dBW
Both channels, 4ohm load	12.3dBW	13.3dBW	13.1dBW
One channel, 2ohms, pulsed	—dBW	14.6dBW	—dBW
Instantaneous peak current		+7.5A	−11.0A
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
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−73.0dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, 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 (IHF)	27.0	27.1dB	27.6dB
Disc (mc) input (IHF)	n/a dB	n/adB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	68.2dB	71.8dB	56.3dB
Aux input	69.2dB	70.3dB	64.3dB
Output impedance (damping)	0.27ohm	0.27ohm	0.33ohm
Channel balance, disc, at 1kHz			0.28dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.05dB	0.22dB	0.87dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.42mV	46kohms, 110pF
Disc (mc) input	n/a	n/a mV	n/a ohms, 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) 40 x 8 x 22cm
Typical price inc VAT £130



Power supply rejection, 40Hz input

Acoustic Research AR Amplifier

Acoustic Research, High Street, Houghton Regis, Beds LU5 5QJ
Tel (0582) 603151

Finished in satin black with silver-grey lettering and dark wood end cheeks, the AR amplifier remains unchanged externally for 1986, although there have been internal improvements. As its appearance suggests, the design shares the parentage of the Cambridge Audio integrated model, which has itself now reappeared in further improved form but was not available in time for the 1986 test programme.

A moderately-priced 35W design, the AR provides disc, tape, tuner and CD inputs, with both moving-coil and moving-magnet disc options. Bass and treble controls are provided, as is a mono button. Speaker connections are 4mm sockets, while all the signal inputs are the usual phonos.

Fully tested in previous editions, the amplifier was carefully re-auditioned and reassessed this time round. However, the technical report and lab results refer to tests carried out on earlier samples.

Internal construction was clearly to fair standards, using two main epoxy printed circuit boards. A decent-sized toroidal transformer supplies the shared reservoirs, with the output direct coupled complementary, and the system non-inverting. Following a variable gain mm/mc input buffer, the RIAA equalisation is performed in two stages; an input buffer feeds the passive tone controls leading to the power amplifier. The steel baseplate of the case itself forms the heatsink.

Sound quality

The current model achieved most respectable scores in the listening sessions, and if anything showed an improvement over the original, being well above average.

Via the auxiliary input the sound was smooth, even bland, with reasonable midband stereo focus and some good depth effects. Musical detail was to a high standard in the mid register, but the amplifier sounded less on control at the frequency extremes.

Via disc some loss of detail and clarity were noted but the standard remained pretty good. Both bass and treble registers were above average and the midband particularly so, with the overall effect quite musical. The amp did not clip particularly well, and the adverse loading, while well-attempted in the sense of maintaining loudness, otherwise served to produce an effect of increasing 'thinness' and muddle. In fact, 100dBA was possible on the difficult load, this improving to a decent 102dB with 8ohms.

Lab results

Rated at 15.5dBW, the second sample gave a generous 18.8dBW, which is heading towards 80W per channel. Power bandwidth was fine at 8ohms but more restricted at 4ohms. Peak power into 8ohms approached 100W (19.5dBW) and held well into 4ohms, while at 2ohms, a reasonable 4dB overall loss occurred. Peak

BEST BUY

current capacity was a generous ±19A. Distortion was satisfactory, with the IM and the 20kHz results only average, but at lower levels the high frequency results improved greatly.

Signal-to-noise ratios were good (second sample) and dc offset satisfactory. All input overloads were ample while separation was fairly typical and could be improved via the aux/CD input. Output impedance was constant and moderate, while channel balance was good at higher levels but deteriorated at low volume settings.

Moving-magnet sensitivity was lower than usual, and the moving-coil gain will not suit the lowest output models such as certain Ortofon models. Note that the mm and mc resistances are the same at 47kohms/150pF, while the aux input impedance is lower than usual at 10kohms; however this should not cause problems except possibly with older sources.

Conclusion

Since our earlier tests were carried out, the construction has been improved, including phono input sockets, while the generous power delivery has been slightly increased. The price has however been held, thereby confirming its fine value rating.

With a fine dry, dynamic range, and a lively musical performance, this amplifier is both versatile and load tolerant. The controls could have a better 'feel' but otherwise the strong performance merits a firm 'Best Buy' rating.

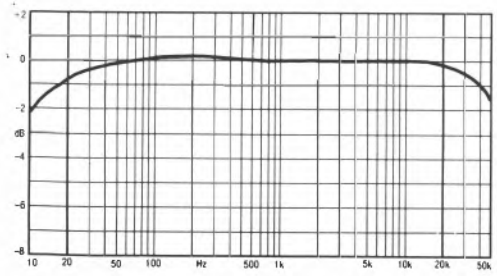
Test measurements

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.

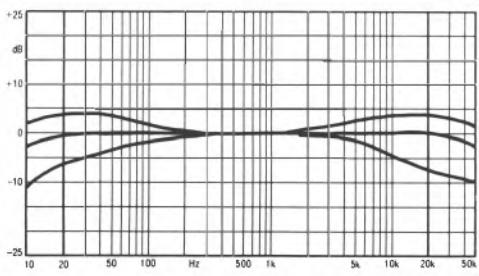
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			35W(= 15.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.8dBW	18.9dBW	18.9dBW
Both channels, 4ohm load	15.5dBW	16.5dBW	14.4dBW
One channel, 2ohms, pulsed	12.0*dBW	15.6dBW	14.0dBW
Instantaneous peak current		+19A	−19A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−70dB	−73dB	−65dB
Intermodulation, 19/20kHz, rated power, aux input			−63dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			> −80dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			> −80dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−79dB
Disc (mc) input (IHF, CCIR weighted)			−75dB
Aux/CD input (IHF, CCIR weighted)			−81dB
Residual, unweighted (volume control at min)			−77dB
DC output offset			34mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	34dB	32dB	30dB
Disc (mc) input (IHF)	31dB	29dB	28dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	−68dB	−62dB	−42dB
Aux input	−70dB	−62dB	−42dB
Output impedance (damping)	0.3ohm	0.3ohm	0.3ohm
Channel balance, disc, at 1kHz			0dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.1dB	0.1dB	5.8dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.52mV	47kohms, 150pF
Disc (mc) input	Phono	0.032mV	47kohms, 150nF
Aux input		24.2mV	10kohms, 50pF

Disc equalisation error, 30Hz-15kHz +0.2dB, −0.3dB
Size (width, height, depth) 43 x 7 x 28.5cm
Typical price inc VAT £175
**Fuse blows at this level*



Disc input: RIAA equalisation accuracy



Tone control/filter responses

Akai AM-A90

Akai UK Ltd, Unit 12, Haslemere Heathrow Estate, Silver Jubilee Way, Hounslow, Middx
Tel 01-897 6388

Akai have generally been seen to put most of their audio marketing efforts into the sale of complete systems. But like other companies with a strong presence in the Compact Disc market, they have recently started to look afresh at the field of hi-fi separates.

Previous Akai amplifiers tested in *Hi-Fi Choice* have tended to reflect their intended market niche as 'system amplifiers', featuring electronic switching and elaborate front panel displays which, of course, contribute nothing to sound quality. However, Akai have worked hard to improve the sound of their latest range of amplifiers, and the new models certainly are rather better than earlier ones.

A top model in the current range, the *AM-A90* is a substantial unit priced at around £400. It is specified at 130W per channel and promises a power delivery sufficient for nearly all purposes, including adverse loads.

Internal construction is quite complex, with a number of boards inter-connected by wiring harnesses, and substantial internal heatsinking is provided. Many 'audiophile' design features have been included, such as zero loop feedback in the output stage, with a bridge balanced, complementary MosFet configuration. The tone controls may be bypassed, while a DC servo is employed in both the phono equaliser and power amp stages. Selected audio components are used, these including a high performance toroidal mains transformer with generous reservoir capacitors.

Comprehensive facilities include moving-coil and moving-magnet cartridge inputs plus four auxiliary and two tape units. The 'record out' selector operates independently for maximum flexibility. Binding posts allow connection of two sets of loudspeakers.

Sound quality

Proving capable of substantial sound levels, the *AM-A90* hit 105dBA on the level test, (8ohms). On CD listening tests this amplifier scored about average, with quite presentable detail, demonstrating good stage width as well as quite good focus and depth. It sounded 'even' in frequency terms, but the mid suffered from a trace of coloration while transients lacked some 'bite' and dynamic impact.

Via the moving-coil input, the loss of transparency and stereo depth was more obvious, the stereo sounding rather flat. The bass rated below average and the mid showed some 'thinning' of tonal balance.

We felt that overall, on its subjective performance via the disc input, this amplifier rated just below average, but nonetheless it was thought to be better than many other comparable Japanese amplifiers.

Lab results

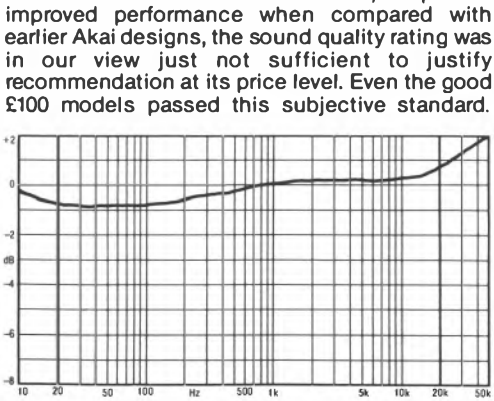
On peaks, this amplifier attained 200W per channel, this agreeing with the peak sound level result. The loss into 2ohms was 3dB, which was quite good in terms of load tolerance. Peak current reached 18.5A, balanced between the two signal polarities, and was better than average. Related to its low feedback design, the harmonic distortion results were poorer than usual, but were nonetheless entirely satisfactory.

Via the moving-magnet input, the high frequency intermodulation distortion was uninspiring at our standard test level, this result associated with a rather small overload margin on the moving-magnet disc input. In practice, the margin shown was likely to produce an audible defect but was set rather too close for comfort. Delayed 'latching' was possible on high-energy clicks from discs.

In other respects this amplifier behaved well, with well ordered sensitivities and signal to noise ratios. Stereo separation could however have been better, particularly in the treble. DC offsets were fine while the output impedance was negligible. Frequency response and equalisations were also to a decently accurate standard.

Conclusion

On paper this amplifier offers a lot for the money — the right story technically, coupled with generous power delivery, good load tolerance and a versatile set of facilities. However, despite its improved performance when compared with earlier Akai designs, the sound quality rating was in our view just not sufficient to justify recommendation at its price level. Even the good £100 models passed this subjective standard.



Disc eq accuracy

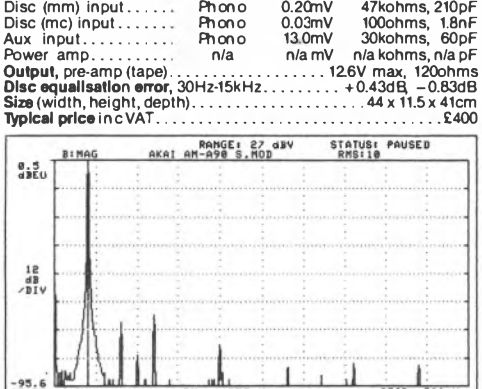
Test measurements

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			130W(=21.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	22.0dBW	22.0dBW	21.8dBW
Both channels, 4ohm load	20.0dBW	20.6dBW	20.4dBW
One channel, 2ohms, pulsed	—dBW	20.0dBW	—dBW
Instantaneous peak current		+18.2A	−19.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−61.7dB	−61.5dB	−55.6dB
Intermodulation, 19/20kHz, rated power, aux input			−64.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−39.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−63.3dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−66.6dB
Disc (mc) input (IHF, CCIR weighted)			−65.1dB
Aux/CD input (IHF, CCIR weighted)			−67.4dB
Residual, unweighted (volume control at min)			−77.8dB
DC output offset			left 1mV, right 4mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	40.4dB	34.4dB	6.8dB
Disc (mc) input (IHF)	40.3dB	39.5dB	34.3dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	56.0dB	53.9dB	27.8dB
Aux input	64.6dB	51.5dB	27.5dB
Output impedance (damping)	0.10ohm	0.10ohm	0.18ohm
Channel balance, disc, at 1kHz			0.17dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.55dB	0.15dB	0.53dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.20mV	47kohms, 210pF
Disc (mc) input	Phono	0.03mV	100ohms, 1.8nF
Aux input	Phono	13.0mV	30kohms, 60pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 12.6V max, 120ohms
Disc equalisation error, 30Hz-15kHz +0.43dB, −0.83dB
Size (width, height, depth) 44 x 11.5 x 41cm
Typical price inc VAT £400



Power supply rejection, 40Hz input

Audiolab 8000A

Cambridge Systems Technology Ltd, 26 Roman Way, Godmanchester, Huntingdon, Cambs PE18 9LN
Tel (0480) 52521

Now a well established model, the *8000A* was the first of a new range of electronics designed by two UK engineers with an established track record in this field. 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; these are however said to be specifically designed to produce a negligible subtraction of 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 pre/power amp use if this is required by the user, but note that in this mode the circuitry which prevents switch-on thumps will not operate.

As well engineered internally as it is finished externally, the amplifer 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 fitted and designed to allow adverse load drive. All discrete circuitry is employed, the mc headamp a particularly careful design; in fact many of the design features are more commonly associated with more costly models.

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.

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

Via aux the sound remained very good, 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.

Lab results

Specified at 50W (17dBW) the amplifier demonstrated a fine power bandwidth at 19dBW into 8ohms. The 4ohm continuous delivery was also pretty good, while its ± 28A peak current capability was more than sufficient for the rated power. Peak level approached 100W per

channel, at 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 in the issue, 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 were well defined. The mm disc characteristic 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 output level at low impedance for other power amplifiers. Subjectively, no significant change in sound quality could be heard with the tone controls engaged.

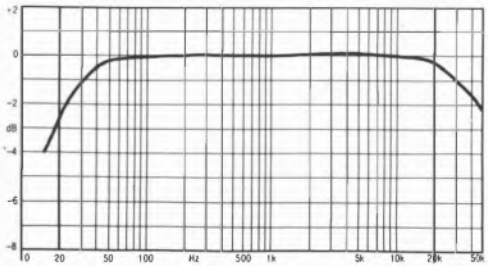
Conclusion

For '86, Audiolab have maintained a good sound quality, this achieved by subtle improvements to the interior circuitry. The *8000A* remains a fine integrated amplifier of very good power delivery and also provides an 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 firmly recommended.

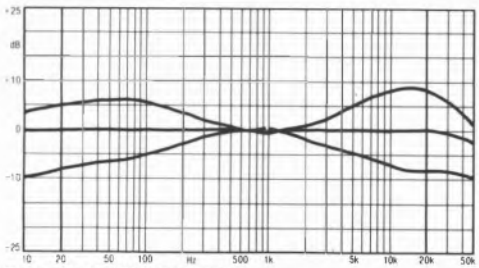
Test measurements

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.

GENERAL DATA	Integrated amplifier		
Power output			
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 input	−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 (IHF, CCIR weighted)			−78dB
Disc (mc) input (IHF, CCIR weighted)			−73dB
Aux/CD input (IHF, 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 (IHF)	29dB	30dB	30dB
Disc (mc) input (IHF)	26dB	26dB	26dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	−90dB	−72dB	−50dB
Aux input	−78dB	−77dB	−56dB
Output impedance (damping)	0.03ohm	0.04ohm	0.12ohm
Channel balance, disc, at 1kHz			0.04dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.04dB	0.0dB	3.6dB
Input data	socket type	sensitivity	loading
Disc (mm) input	DIN	0.3mV	47kohms, 35pF
Disc (mc) input	DIN	0.007mV	100ohms, 4.7nF
Aux input	DIN	12mV	20kohms, 70pF
Output, pre-amp (tape)			7.7V max, 600ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, −2.2dB
Size (width, height, depth)			44.5 x 7.4 x 34cm
Typical price inc VAT			£299



Disc input: RIAA equalisation accuracy



Tone control/filter responses

Audiolab 8000C/8000P

Cambridge Systems Technology Ltd, 26 Roman Way, Godmanchester, Huntingdon, Cambs PE18 9LN
Tel (0480) 52521

In development terms, these two recently released units were actually begun before the successfully launched *8000A* integrated amplifier, which first made an appearance in 1983. The overall design plan included the use of a matching range of cases, and hence the 'C' preamplifier closely resembles the integrated 'A'. However while there are common sections, the 'C' has been significantly upgraded by the use of improved components, wiring and power supplies, using the space vacated by the big power transformer. Allocated its own case, with a still larger transformer than before, the power amplifier has blossomed into a 100W (20dB/W) unit with generous reserves of current as well as an ability to drive adverse loads.

These modern all transistor designs offer impeccable specifications, and yet much care has also been devoted to how they sound. The *8000C* pre-amp in particular is extremely versatile — for example, it includes low noise moving coil inputs as well as moving magnet. Sensible tone controls are fitted, which are virtually inaudible in terms of their effect on the sound quality, while two tape decks and many inputs may also be accommodated. A headphone outlet fed by its own small power amplifier, is also provided in the pre-amp.

Eminently sensible in general design, the equipment is well built, well finished, well styled and well lettered in a legible print. No silly gimmicks such as power level indicators or flashing lights are present. The power amplifier has no controls bar the on/off switch, while speaker connection is via standard 4mm socket/binding posts.

Discrete transistor circuits are used in carefully designed 'op-amp' configurations, and interestingly a single rail power supply is used for the pre-amplifier allowing high quality electrolytic coupling capacitors to be fitted, these properly polarised. A direct coupled dual rail supply is fitted to the power amplifier, the output stage a paralleled complementary array with specially fast thermal tracking for the output biasing to minimise crossover effects and provide a rapid warm-up.

Sound quality

Used with good cable, the Audiolab separates provided an impressive standard of sound quality, proving tidier, more refined and also more powerful than the *8000A*. High levels were produced into both loadings, 105dBA into 8ohms and 104dBA into 4ohms.

The good standard of stereo depth was maintained, and interestingly, that slightly cold 'clinical' quality of the *8000A* was also preserved, this better suited to mildly rich speakers and cartridges. Precise and detailed with a clean articulate bass, the Audiolabs

achieved competitive scores which set them apart in their price territory.

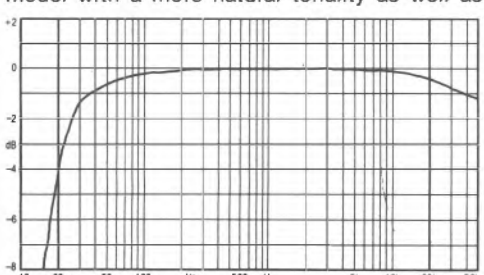
Lab results

Covering the power amplifier first, this was clearly a very 'gutsy' performer with immaculate figures for power bandwidth, adverse load delivery and peak current, here to the test limit of ±40A! The pulsed delivery into 2ohms corresponded to 400W per channel into this load. All distortions were very low, in fact negligibly so, while dc offsets were also microscopic, thanks to the special dc servo in the amplifiers. The power amp needed just over a volt input to give full output, while input loading was mild, at 47ohms/320pF.

The pre-amp also measured very well, with flat frequency responses, good noise levels, sensible sensitivities and impedances, plus fine overload margins. Stereo separation was very good, while channel balance held to close tolerances. Distortion was seen at negligible levels. The pre-amp could provide up to 10V output, from a low source resistance of 100ohms.

Conclusion

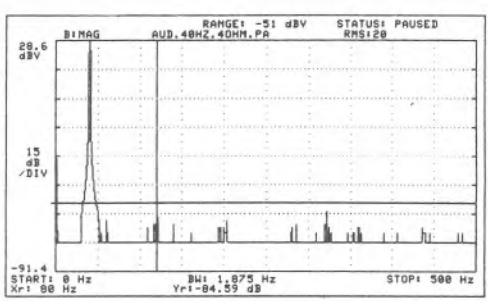
For '86, the preamp loses the contentious IEC rolloff on the disc input while both units were sufficiently revised to necessitate renewed auditioning. Both were found to be notably improved — to the order of 10% for the preamp, and probably more for the power amplifier. Commended in the last edition, the pre-amp has held its competitive position, ranking high in its price category. Previously the power amplifier was held back but now has blossomed into a fine model with a more natural tonality as well as improved stereo perspectives. This powerful, load tolerant model is well priced, and is now strongly recommended.



Disc eq accuracy and (right) power supply rejection

GENERAL DATA Pre- and power amplifier

Power output			
Rated power into 8ohms, maker's spec.	100W(= 20dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.6dBW	21.8dBW	21.4dBW
Both channels, 4ohm load	19.6dBW	20.0dBW	19 6dBW
One channel, 2ohms, pulsed	—dBW	20.3dBW	—dBW
Instantaneous peak current		+ 40A	– 40A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	< – 90dB	– 93dB	– 74dB
Intermodulation, 19/20kHz, rated power, aux input	< – 100dB		
Intermodulation, 19/20kHz, at 0dBW, disc(mm)	– 82dB		
Intermodulation, 19/20kHz, at 0dBW, disc(mc)	– 83dB		
Noise			
Disc (mm) input (IHF, CCIR weighted)	– 70dB		
Disc (mc) input (IHF, CCIR weighted)	– 67dB		
Aux/CD input (IHF, CCIR weighted)	– 70dB		
Residual, unweighted (volume control at min)	– 80dB		
DC output offset	left<1mV, right <1mV		
DC offset, pre-amp	left<1mV, right <1mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	26dB	31dB	30dB
Disc (mc) input (IHF)	30dB	26dB	25dB
Aux/CD input (IHF)	<20dB	20dB	20dB
Stereo separation			
Disc input	82dB	78dB	66dB
Aux input	—dB	—dB	—dB
Output impedance (damping)	0.025ohm	0.028ohm	0.084ohm
Channel balance, disc, at 1kHz	0.1dB		
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.15dB	0.2dB	0.4dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.28mV	47kohms 50pF
Disc (mc) input	Phono	0.018mV	10ohms —nF
Aux input	Phono	15/52mV	20kohms —pF
Power amp	Phono	1100mV	47kohms 320pF
Output, pre-amp (tape)	>5V <600ohms		
Disc equalisation error, 30Hz-15kHz	+ 0dB, – 2dB		
Size (width, height, depth)	45 x 8 x 34cm, 45 x 8 x 34cm		
Typical price inc VAT	£275, £450		



Audio Research SP8/D70

Absolute Sounds Ltd, 42 Parkside, London SW19
Tel 01-947 5047

SP8 only illustrated: D70 is on larger chassis

Both of these US-built audiophile products have featured prominently in previous *Hi-Fi Choice* editions — and though the two reviews have been combined for convenience here, the *SP8* pre-amplifier and *D70* power amplifier have both been fully assessed both separately and in combination.

Something of an audiophile legend, the *SP8* is a valve (tube) design offering superb build quality. The design follows the purist school, and no tone controls or filters are provided, nor is there provision for a moving-coil input. The highest output moving-coils may however prove suitable for moderate listening levels, but if decently low input noise levels are required, then an external high quality pre-amp is essential.

Retested for 1985 in the light of the newer *SP10*, the *8* had an improved circuit board and a number of detail changes. ('Old' *SP8*s can be rebuilt to the new standard at a cost of around £400.)

Inside, the power supply is almost as complex as the amplifier section with dc regulated lines to both the HT lines and to the valve heaters. Selected triodes are used throughout.

Descended from a long line of valve power amplifiers. the *D70* is rated at 65W (18dB/W) per channel, which is a fair spec for a reasonably sized single chassis unit such as this. Screw terminals are present for speaker connection, with 4, 8 and 16ohm matching taps.

Sound quality

The *SP8* is undoubtedly a very fine-sounding unit. Equally good via aux or mm inputs, it was characterised by a fine spatial effect, the sound stage full of ambience and depth, with a natural perspective. Stereo focusing was very good, the mid balance exceptionally pure and natural, while the frequency extremes sounded firm, detailed and well controlled. The overall quality closely approached that of the magnificent *SP10* and proved highly involving, with excellent rendition of subtle detail. Mild microphony was noted, however, and an isolating support gave further improvement.

Extended comparative listening showed the *D70* to be capable of revealing the full musical potential of the components connected to it, from loudspeaker to cartridge. The bass was extended and very revealing, if slightly warm and softened, while the mid and treble were sweet and open, with an uncanny, lifelike quality on vocals and acoustic instruments.

Stereo images showed good width and focus with exceptional spaciousness, depth and ambience, plus convincing layered effects.

Lab results

The *SP8*s sensitivities are those obtained with the unit as supplied but they may be halved to achieve a lower value by a small board change

which can be carried out by the supplier. Signal-to-noise ratios were above average but not outstanding, but input overload margins were exemplary.

As is often the case with valve power amps, the *D70*'s lab results were unexceptional, though they were fairly good for a valve design. The output met spec over the full power bandwidth and the unit showed a very wide frequency response. Mismatched into lower impedances, the output fell quickly by nearly 5dB into 4ohms, and by 10dB into 2ohms. Peak current was a modest ±5A. It was also easy to drive, requiring just under 1 volt into a high impedance, and while its output impedance was higher than usual, this should not cause any trouble with the majority of speaker systems.

Conclusion

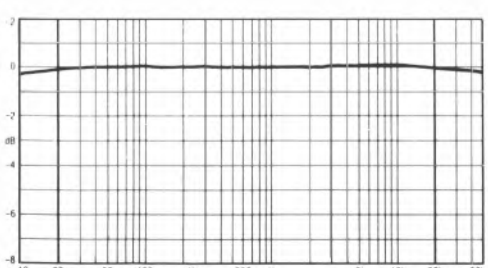
In revised form, this new *SP8* puts even last year's version in the shade. Definition, space, focus and 'believability' have all taken a major step forward, and the *SP8* now offers first class quality at a comparatively realistic price; in context, it can even be said to offer fine value for money! For those appreciative of such quality, the *SP8* is strongly recommended, and perfectly matched the *D70*. Unsuited to really trying loads, the *D70* nonetheless made a fair stab at the Magneplanar *MG III*, and drove normal 8ohms and sensible electrostatic loads very well. The sound was exceptionally good and would do justice to the finest ancillaries. Above all, its great dimensionality and musicality place it in the highest category.

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.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	65W(= 18dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.6dBW	18.8dBW	18.5dBW
Both channels, 4ohm load	13.9dBW	14.0dBW	11.0dBW
One channel, 2ohms, pulsed	—dBW	8.0dBW	—dBW
Instantaneous peak current		+5A	−5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−48dB	−58dB	−48dB
lw power, aux input			−68dB
Intermodulation, 19/20kHz, at rated power			−60dB
Intermodulation, 19/20kHz. at 0dBW			−75dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−75dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−78dB
Residual, unweighted (volume control at min)			−77dB
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	40dB	43dB	42dB
Disc (mc) input (IHF)*	60dB	63dB	62dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	45dB	57dB	40dB
Aux input	70dB	61dB	35dB
Channel balance, disc, at 1kHz			0.12dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.03dB	0.15dB	0.25dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.2mV	47kohms 50pF
Disc (mc) input*	Phono	0.2mV	adjust adjust
Aux input	Phono	28mV	50kohms 100pF
Output, pre-amp			50V max, 971ohms
Disc equalisation error, 30Hz-15kHz			+0.1dB, −0.1dB
Size (width, height, depth)			48 x 13.4 x 26cm 48 x 17 x 42cm
Typical price inc VAT			£1998, £2190

(Note: distortion figures D70 only, remainder SP8 only. Same input used for mc and mm)*



Disc input: RIAA equalisation accuracy

D70 power amplifier

RECOMMENDED

Beard P35 power amplifier

Beard Audio Systems Ltd, Unit B1, Askew Crescent Workshops, London W12 9DP
Tel 01-749 4258

Beard's well-known British-made valve amplifiers had been using GEC output valves but when UK production of these ceased, designer Bill Beard sought an alternative solution for the design of his new smaller power amplifier. The venerable EL 84 is still commonly used and although of modest power rating, it is cheap enough for several to be used in parallel pairs. In fact the *P35* has six of these output valves per channel to give a 35W rating in an ultra-linear configuration.

Superbly built on a massive chromed chassis, the circuit is a simple, straightforward one, using high quality components and a substantial reservoir capacity. A large central toroidal transformer supplies the two channels which have independent rectification and storage. 'Floating' biasing simplifies the construction though each valve needs to be individually set in production after 'burn in' at the factory.

A standby mode may be selected where appropriate, providing half power and a vastly increased operating life. Speaker connection is via Michell gold plated binding posts which also take cable or plugs up to 4mm.

Sound quality

Beard's best yet, this amplifier proved capable of higher sound levels than its rating suggested reaching 102dBA on the 8ohm load. Mild transformer hum was noted on our final sample, so it probably should not be located too close to the listener. The sound was considered transparent, with pleasing depth and ambience plus an elegant, airy tonal quality. Slightly bright, it nevertheless reproduced complex vocals particularly well, while both bass and treble registers were rated pretty good in this category. Other key qualities included good low level detail and dynamics; overall, a lively musical effect with reasonably good stereo focus.

Lab results

In the table, our clipping limit of 1% distortion was relaxed to 3% to accommodate the rising high frequency distortion of this model. For the rating the 2ohm delivery was quite healthy, while the peak current level, of 5.5A mean, indicated a fair load tolerance. At rated power, the 20kHz harmonic distortion approached 3% but improved at lower power levels. Conversely, the more important high frequency intermodulation result was pretty good, and better still at lower powers.

Predictably, stereo separation was excellent, due to the virtually double-mono construction. Rated as satisfactory as regards load tolerance, this low feedback design gave a consistent output impedance of 1ohm which would slightly modify the perceived tonal balance of some speakers. On the 40Hz power test the supply

modulation results were unimpressive.

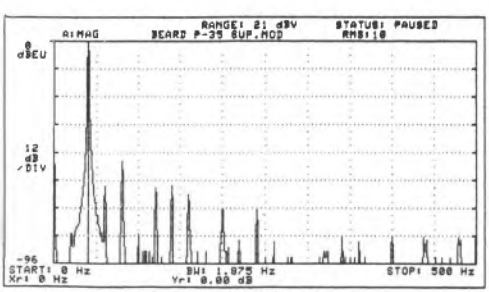
Conclusion

While this amplifier will need some care in matching it to a given system, it offered a genuinely high sound quality, with that distinctive and valued transparency associated with better valve designs. Considering the high build quality it was well priced, and comes confidently recommended.

GENERAL DATA			Power amplifier
Power output			
Rated power into 8ohms, maker's spec			35W(=15dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.3dBW	16.5dBW	15.7dBW
Both channels, 4ohm load	11.7dBW	11.8dBW	7.7dBW
One channel, 2ohms, pulsed	—dBW	12.4dBW	—dBW
Instantaneous peak current		+6.5A	−6.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−57.1dB	−58.2dB	−33.3dB
Intermodulation, 19/20kHz, rated power, aux input			−60.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−70.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−—dB
Disc (mc) input (IHF, CCIR weighted)			−—dB
Aux/CD input (IHF, CCIR weighted)			−86.0dB
Residual, unweighted (volume control at min)			−70.0dB
DC output offset			left 0mV, right 0mV
DC offset, pre-amp			left —mV, right —mV
Stereo separation			
Disc input (mc)	—dB	—dB	—dB
Aux input	91.5dB	71.0dB	45.9dB
Output impedance (damping)	0.88ohm	0.88ohm	0.84ohm

Input data	socket type	sensitivity	loading
Disc (mm) input	—	—mV	—kohms, —pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	—	—mV	—kohms, —pF
Power amp	Phono	160mV	650kohms, 320pF

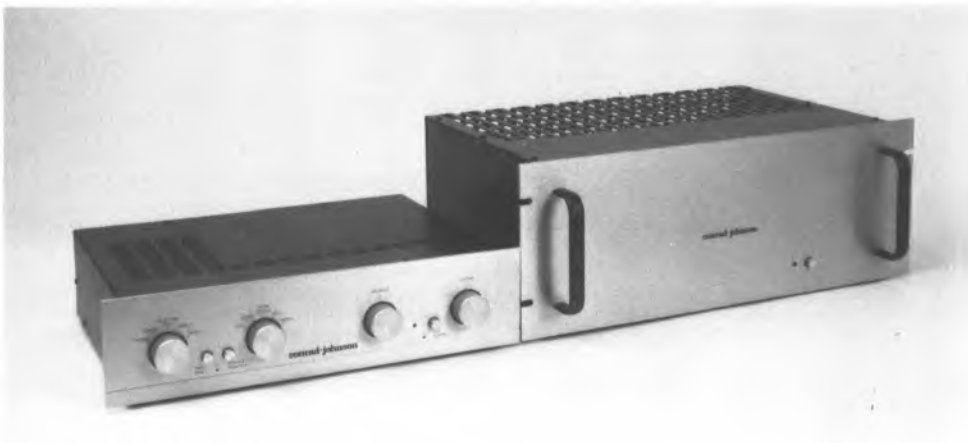
Output, pre-amp (tape) —V max, —ohms
Disc equalisation error, 30Hz-15kHz —dB, —dB
Size (width, height, depth) 44.5 x 15 x 33.5cm
Typical price inc VAT £695



Power supply rejection, 40Hz input

Conrad Johnson PV5/MV50

Automation Sciences Co, 20 Little Gaddesdon, Berkhamsted, Herts HP4 1PA
Tel (044) 284 2786



Long established in their American home market, Conrad Johnson's high quality valve amplifiers are now gaining a strong foothold in the UK too. The line currently includes products from about £800 upwards, and the *PV5/MV50* combination occupy the middle price range — though at around £3400 a pair, they are clearly 'high end' audiophile products as far as the UK is concerned.

For 1986, the *PV5* is now more simply made, and is without the rack mounting and handles of the earlier version. changes have also been made in the internal construction; we reviewed the version in which the mode selector and balance controls had been bypassed to improve transparency. The *PV5* is roughly equivalent to the Audio Research *SP8* at a similar price. Well equipped, its facilities include a moving-magnet input which has sufficient gain to work with higher-output moving-coil cartridges, at the expense of some background noise; ideally a good step-up transformer (at extra cost) is required for m-c use. The *PV5*'s output characteristics are compatible with most power amplifiers.

A compact power amplifier of fairly traditional design, the *MV50* is rated at 50W (17dBW) per channel. Transformer taps are provided for 4, 8 and 16ohm. The *MV50* was reasonably load-tolerant, with a better current delivery than the earlier *MV45* (reviewed in the 1985 edition).

Sound quality

Assessed in combination, the CJs offered a very pleasant and musical sound, almost what one might have been led to expect from traditional tube gear. At low to moderate power levels, there was a feeling of delicate grace about the sound, with a tonal richness and spacious perspective which beguiled the listening panel.

Auditioned separately, both *PV5* and *MV50* performed very well, possessing high qualities of fine stereo precision, depth, tonal accuracy and detail which placed them in the top rank.

The *MV50* possessed undeniable virtues, harking to the *Premier* series. Good sound levels were achieved, free from strain, and the 4ohm tap gave the finest control and bass attack. Treble was excellent, bass very natural. Depth perspectives were finely-drawn with a relaxed musical performance full of subtle detail and combined with excellent stereo focus.

Lab results

Power output was excellent at mid frequencies, but was weaker at the band extremes. For a 1% distortion limit, the 20Hz power was 16.2dBW. The 4ohm delivery was much better than for the old *MV45*, showing for example, a 6.5dB improvement at 20Hz. Peak current and 2ohm

delivery were also quite good.

Low level harmonic distortion was very good, and at full power the 1kHz distortion held to 0.05%, though it deteriorated at the frequency extremes.

For the pre-amp, noise levels were satisfactory (only just for mc) while overload levels were exemplary. Stereo channel separation was about average with volume tracking and balance both excellent. Disc equalisation was essentially flat, bar a mild lift at the extreme low frequencies. The power amp output impedance was reasonable at around 0.8ohm, (8ohms) contrasting with the *MV 45* which gave a weak 3.5ohms at 20kHz.

Conclusion

These new series CJ's performed very well on audition. The current 'bypassed' *PV5* represents a significant upgrade, bringing it to a fully competitive position and endowing it with genuine audiophile class. The *MV50* is a most welcome introduction, offering an exceptional performance. 'Premiere 50' would perhaps have been a fairer title as we felt it could teach the old *Premiere Four* a thing or two. The *MV50* partners both the *PV5* and the *Premiere Three* well, the latter also available 'bypassed', and with an improved sound quality.

Together the review pair represent a substantial audiophile achievement at a cost of some £3400, attaining a firm recommendation.

GENERAL DATA Pre- and power amplifier

Power output

Rated power into 8ohms, maker's spec	50W(= 17dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.2dBW	18.1dBW	16.2dBW
Both channels, 4ohm load	14.4dBW	14.9dBW	11.1dBW
One channel, 2ohms, pulsed	—dBW	14.5dBW	—dBW
Instantaneous peak current		+7.3A	−9.7A

Distortion

Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−41.8dB	−66.7dB	−34.8dB
Intermodulation, 19/20kHz, rated power, aux input			−24.8dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−57.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)*			−63dB

Noise

Disc (mm) input (IHF, CCIR weighted)*	−62dB
Disc (mc) input (IHF, CCIR weighted)*	−53dB
Aux/CD input (IHF, CCIR weighted)	−80dB
Residual, unweighted (volume control at min)	−76.5dB
DC output offset	left 0mV, right 0mV
DC offset, pre-amp	left 0mV, right 0mV

Input overlead

Disc (mm) input (IHF)*	36dB	40dB	34dB
Disc (mc) input (IHF)*	56dB	60dB	54dB
Aux/CD input (IHF)*	>20dB	>20dB	>20dB

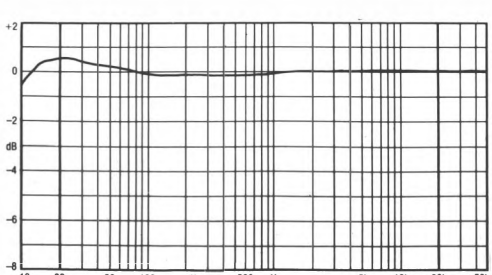
Stereo separation

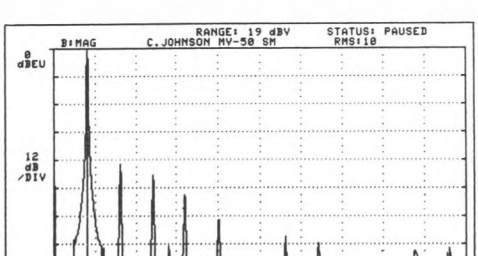
Disc input*	52dB	60dB	40dB
Aux input	98.2dB	100.9dB	71.6dB
Output impedance (damping)	0.87ohm	0.87ohm	0.58ohm
Channel balance, at 1kHz			0.10dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.08dB	0.10dB	0.10dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.041mV	47kohms, 60pF
Disc (mc) input	—	0.041mV	47kohms, 60pF
Aux input	Phono	5.2mV	43kohms, 30pF
Power amp	Phono	114mV	100kohms, 270pF

Outputs, pre-amp (tape) >20V max, 140ohms
Disc equalisation error, 30Hz-15kHz +0.43dB, −0.1dB
Size (width, height, depth) 41 × 10 × 27cm, 48 × 27 × 32cm
Typical price inc VAT £1875, £1540

*Note: 'mc' figures refer to 'mm' input; channel balance, MV50 only, 500mV input; *PV5/MV45*





Disc eq accuracy and (right) power supply rejection

Counterpoint SA7/SA12

Absolute Sounds, 42 Parkside, London SW19
Tel 01-947 5047

One of a range of Californian valve pre-amplifiers, the *SA-7* is an elegantly simple design, offering a minimum of facilities. This year we have added Counterpoint's *SA-12* power amplifier to make up a competitively-priced and powerful high-quality combination.

The *SA-7* pre-amp's most obvious feature is its unusually high gain on what is nominally a moving-magnet disc-input. Set for IHF 0.5V output, the disc input sensitivity is just under 0.2mV, which in practice will be found suffcient for use with a number of moving-coil cartridges (this producing satisfactory noise levels). In fact when used as a moving-magnet input, its overload levels are so poor that moving-coil use is encouraged.

Fascinating details include the use of no feedback throughout with all triode circuitry. RIAA equalisation is entirely passive and the first two valves (ECC88) are run under low noise, grid leak operation. A reasonably low output impedance is provided by a cathode follower, but the tape output is a high impedance when on disc, and should not be loaded, even by an interconnect cable, when not in use. Phono sockets provide for disc, tape, Compact Disc and tuner inputs, selected by lever switches.

Rated conservatively by the manufacturers at 100W (20dBW) per channel, the *SA-12* is a low-feedback hybrid design, having tube drivers and MosFet output devices.

Sound quality

Properly interfaced, the *SA-7* pre-amplifier provided a sound quality well beyond its price class, and bridged the gap to models at £1000 plus. It sounded alive and open, with an involving, dynamic quality. Good articulation and detail were both maintained over the whole frequency range, while stereo width and depth were presented well. Essentially musical, in tonal terms it nonetheless showed a hint of upper mid thinness, while the upper treble sounded a little 'careless' — not fully focused or precise enough.

As for the *SA-12*, this impressive power amplifier proved capable of high sound levels in an exciting dynamic manner. Like the *SA-7*, it showed very fine mid transparency, but was a trifle untidy at band extremes. Overall the standard was high, a little better than the *SA-7*, with clear stereo of decent depth and focus.

Lab results

The power amp delivered around 200W programme, confirming its generous dynamics. With an average peak current of 40A, it was beefy and load tolerant too (giving 800W true peak per channel into 2ohms). Distortion was just satisfactory at 0.5%, mid band, with the output resistance moderate at 0.33ohms. The high

RECOMMENDED

frequency intermodulation result was rather disappointing, and was perhaps associated with the moderate treble 'grain' we heard.

For the pre-amplifier, the intermod result was little better and only acceptable when used as a moving-coil input. Moving-magnet signal levels tended to overload it, but fortunately background noise was quite low.

With a fairly high impedance output load (greater than 50kohm), the frequency response was very wide, and the RIAA equalisation was also pretty accurate with just a hint of rolloff by 20kHz. The output impedance was moderate at 860ohms, though long cable runs are not recommended — say in excess of 1000pF total capacitance including the power amplifier. Some crosstalk was noted between inputs and unused sources are best left switched off.

Conclusion

The *SA-7* has maintained its competitive position and for the price, it offers an inspiring transparency plus, a feeling of involvement; a near-audiophile performance here. The *SA-12* is another very worthy introduction offering a surprisingly similar sound. The *SA-12* is a real power-house, our subjective ratings indicating that it is probably the finest available in its power/price grouping. Magneplanar speakers spring to mind in this connection — here is an economical *MG3*-driver, louder even than the Krell *KSA-100!* Both these Counterpoint models are comfortably recommended.

(Note: if any odd noises occur with the pre-amplifier, persevere, valve replacements will generally sort them out!)

Test measurements

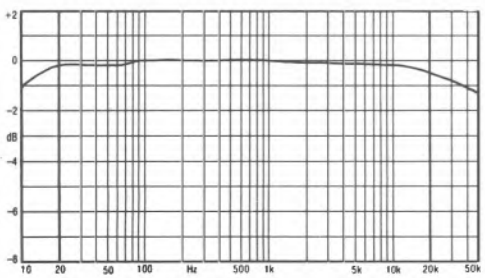
To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	100W(=20dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.1dBW	22.7dBW	17.8dBW
Both channels, 4ohm load	17.9dBW	18.2dBW	17.1dBW
One channel, 2ohms, pulsed	—dBW	23.0dBW	—dBW
Instantaneous peak current		+46A	−35A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−44.4dB	−46.3dB	−46.7dB
Intermodulation, 19/20kHz, rated power, aux input			−27.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−72dB
Disc (mc) input (IHF, CCIR weighted)			−58dB
Aux/CD input (IHF, CCIR weighted)			−72.7dB
Residual, unweighted (volume control at min)			−85.3dB
DC output offset	left—15mV, right—30mV		
DC offset, pre-amp	left mV, right mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	−2dB	12dB	11dB
Disc (mc) input (IHF)*	18dB	32dB	37dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	70dB	60dB	47dB
Aux input	41.9dB	72.8dB	62.4dB
Output impedance (damping)	0.30ohm	0.33ohm	0.36ohm
Channel balance, disc, at 1kHz			0.29dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.17dB	0.58dB	2.95dB

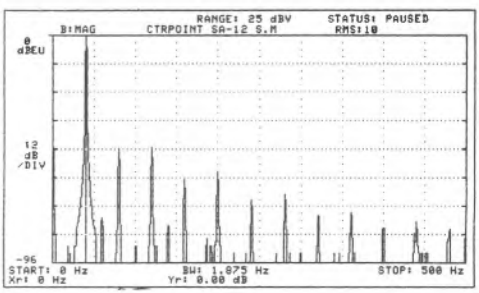
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.17mV	45kohms, 300pF
Disc (mc) input*	—	0.17mV	45kohms, 300pF
Aux input	Phono	31mV	28kohms, 110pF
Power amp	Phono	105mV	89kohms, —pF

Outputs, pre-amp (tape) >15V max, 860ohms
Disc equalisation error, 30Hz-15kHz +0.1dB, −0.3dB
Size (width, height, depth) 48 × 12 × 34cm
Typical price inc VAT £777, £1300

**Same input used for moving-coil*



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Creek CAS4140

Creek Audio Systems, 2 Bellevue Road, Friern Barnet, London N11 3ES
Tel 01-368 4425

Derived from the established *'4040*, which has been recommended in two previous *HFC* editions, the *CAS4140* represents Creek Audio Systems' entry into a higher price bracket. While the *'4040* originally sold for little more than the magic figure of £100, and is today priced at a competitive £135, the *'4140*'s £165 tag puts it slightly above the £140 level of the current 'budget heavyweights' from Mission and Rotel.

Though designed with optimum sound quality as top priority, the *'4040* does provide such useful facilities as a headphone socket, switchable subsonic filter and tone controls, these last being omitted from the newer design. For this edition, we auditioned the latest *'4040*, while including the *'4140* in the main laboratory test programme.

Nominal power rating is the same as for the *'4040*, namely 35W per channel, and there are numerous other common features. However, the power supply has been increased in size to improve the current delivery into more difficult speaker loads.

While phono sockets are provided for the disc input, the tape, auxiliary and tuner inputs are DIN. Speaker connections are plain 4mm sockets, providing both headphone-switched and 'direct' (unswitched) loudspeaker connections.

In contrast to most modern designs this amplifier is capacitor coupled, via 3,300μF electrolytics, the channels using separate reservoirs of 4700μF, 63V rating. The revised disc input is based on an integrated circuit; the amplifier is built on a single printed circuit of good build quality.

Sound quality

While listening tests referenced it to the overall amp field, the new *'4140* was also compared with the latest *'4040*, an interesting exercise. In our view, the *'4040* gave a balanced performance on both moving-magnet and auxiliary/CD inputs. But the *'4140* sounded better via CD and worse on analogue disc, this despite technical improvements, including an upgraded overload margin, to the disc input. Here the *'4140* sounded dulled, with softened bass, with some 'phasiness' in the stereo image reducing stereo focus, while depth effects were unexceptional.

On CD, the sound tightened, with a firmer bass and better definition. The bass-mid area was pretty good, but from the mid-treble upwards, it lacked transparency, and the main treble range suffered from some 'grain' and breathiness on vocal sibilants.

Lab results

Peak sound levels of 101dBA were possible with the standard load, and the level held well into 4ohms. With a rated power of 35W (15.5dBW), this amplifier could raise 16.5dBW on peaks at 8ohms,

and still provided a level of almost 14dBW into 2ohms on peaks. Short-term current delivery had increased from the 9.5A of the *'4040* to around 15A, and in this respect the load tolerance of the *'4140* was very good.

Distortion levels were satisfactory and in fact rather better than for the *'4040*, particularly with respect to disc intermodulation, previously found untestable. This still looks weak on the *HFC* reading, but improved quite rapidly at less stressful input levels.

Noise levels were fine, while the amplifier exhibited no DC offset. Input overload margins were now generally satisfactory and very good channel separation figures were recorded. However, channel balance deteriorated at very low volume settings. On the 40Hz power test, some power supply intermodulation products were evident. The auxiliary input showed a basically flat response, but the analogue disc input showed some response tailoring with a midband lift and a mildly rising low bass.

Conclusion

Via the auxiliary socket the *'4140* was clearly improved, but on the moving-magnet terminal we were less happy with its performance. Taken overall it was rated as very similar to the *'4040*, and taking into account its higher price, we felt this placed it in the 'worth considering' category, while the *'4040* (see summary review) continues to be recommended.

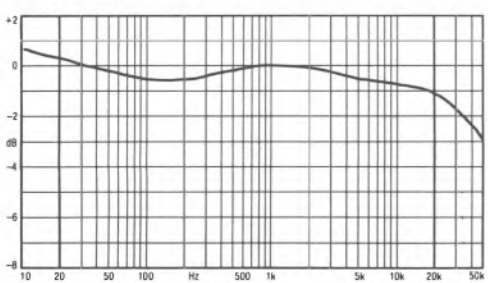
Test measurements

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.

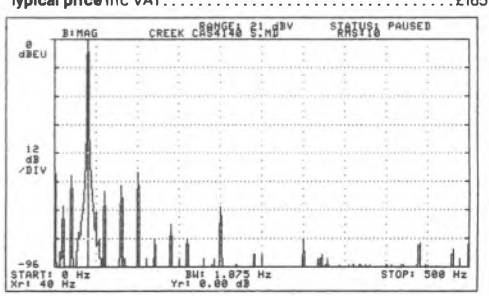
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			30W(=15dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	14.7dBW	15.5dBW	15.3dBW
Both channels, 4ohm load	11.6dBW	13.3dBW	13.1dBW
One channel, 2ohms, pulsed	—dBW	13.8dBW	—dBW
Instantaneous peak current		+13A	−19A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−55.6dB	−61.6dB	−57.6dB
Intermodulation, 19/20kHz, rated power, aux input			−64.2dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−27.0dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−68.5dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−72.0dB
Residual, unweighted (volume control at min)			−73.0dB
DC output offset			left 0mV, right 0mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30.5dB	30.0dB	16.6dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	48.7dB	84.2dB	59.4dB
Aux input	69.7dB	70.0dB	45.2dB
Output impedance (damping)	−0.84ohm	0.04ohm	0.06ohm
Channel balance, disc, at 1kHz			0.22dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.16dB	0.14dB	5.20dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.97mV	47kohms, n/a pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	DIN	70mV	17kohms, 20pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 3.92V max, 680ohms
Disc equalisation error, 30Hz-15kHz +0.04dB, −0.9dB
Size (width, height, depth) 42 x 6 x 20cm
Typical price inc VAT £165



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Croft Micro

Croft Acoustics, 15 Harrison Road, Erdington, Birmingham B24 9AB
Tel (021) 373 1442

The *Micro* is Croft Acoustics' least expensive product, and perhaps rates as the world's most value-conscious valve pre-amplifier. Drawing on Croft's experience in designing and manufacturing upmarket products, the only compromise involved in the *Micro*'s construction appears to be in the case.

This pre-amp offers a single moving-magnet disc input (just adequate for the higher output moving-coil cartridges provided the power amp sensitivity is healthy enough), plus CD, tuner and tape. No balance or tone controls are included.

Inside, the hardwired construction (using single strand wire) is to a high standard throughout, with all power supplies fully regulated, while audiophile-grade capacitors are used in the RIAA disc equalisation and coupling networks. Each disc input uses a double triode, with shunt feedback equalisation, and the line stage has unity gain, comprising a simple cathode-follower buffer. With some sources, the auxiliary input gain may be too low and the intending purchaser should therefore check compatibility with other equipment. Compact Disc will be fine but some tuners or cassette decks may prove too quiet in the context of a given system combination.

Sound quality

Both disc and auxiliary inputs set a very high standard. On disc, the sound was lively and dynamic, transparent and basically well balanced. No specific weaknesses were observed.

A similar result was obtained via auxiliary (CD). The bass showed drive and extension, with the treble just a little 'fuzzy'. Detail and depth effects were fine and stereo images well focused. It proved notably unfatiguing, with a stable, coherent quality.

Background noise was also satisfactorily low when used with moving-coil cartridges of decent output such as the van den Hul *MC10 Super.*

Lab results

Measured performance was to a textbook standard, with negligible distortion and satisfactory overload margins, although the latter deteriorated at high frequencies. Channel separation was fine, while signal to noise ratios were particularly good. Output impedance was satisfactorily low, and sufficient for selected cable runs of up to five metres.

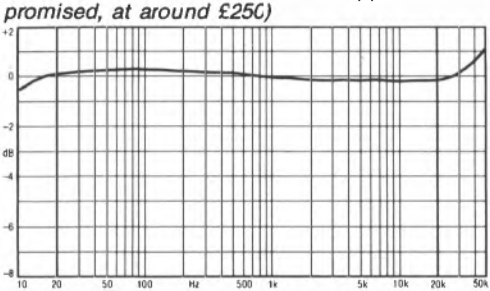
The RIAA equalisation was commendably accurate at ±0.2dB from 30Hz to 15kHz, rising a little at ultrasonic frequencies, to +2.1dB at 100kHz. Note that the rated input sensitivities were for a nominal 0.5V nominal IHF output level.

Conclusion

We really liked this modest pre-amp. If carefully interfaced to a selected system, the sound quality

competed with some of the best pre-amplifiers costing two or three times the price, and for the valve enthusiast, the *Micro* is a godsend. An exceptional product, it can only be strongly recommended, as no Best Buy category exists for separates!

Note: A version of less utilitarian appearance is promised, at around £250)



Disc input: RIAA equalisation accuracy

GENERAL DATA			Pre-amplifier
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−76.0dB	−78.3dB	−76.5dB
Intermodulation, 19/20kHz, rated power, aux input			−93.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−41.0dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−73.5dB
Aux/CD input (IHF, CCIR weighted)			−92.0dB
Residual, unweighted (volume control at min)			−86.5dB
DC offset, pre-amp			left 0mV, right 0mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	22.8dB	24.0dB	5.9dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	61.2dB	62.8dB	36.0dB
Aux input	101.3dB	82.0dB	57.3dB
Channel balance, disc, at 1kHz			0.37dB
Volume/balancetracking	0dB	−20dB	−60dB
Aux input	0.02dB	0.19dB	6.20dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	2.92mV	47kohms, 110pF
Aux input	Phono	550mV	480kohms, 45pF
Output, pre-amp (tape)			11.1V max, 500ohms
Disc equalisation error, 30Hz-15kHz			+0.26dB, −0.16dB
Size (width, height, depth)			25.5 x 7 × 18.5cm
Typical price inc VAT			£150

Deltec pre-amplifier

Deltec Precision Audio, 16 Claude Road, Roath, Cardiff CF2 3PZ.
Tel (0222) 482818

This upmarket pre-amplifier shows a strong commitment to high quality design and incorporates the company's experience regarding cable sound quality. Built in Wales, the unusual case is based on an instrument housing of unconventional styling. No unnecessary facilities are provided in this 'straight line' design, our review samples coming equipped for both moving coil and the usual auxiliary inputs. Disc input is via (electrically) floating phono sockets, hard wired to the circuit board, while the other inputs are in DIN, with the outputs in XLR (unbalanced).

The circuitry is discrete, built as a double mono configuration, using top quality components and superb power supply arrangements. Internal wiring is in silver plated PTFE 'Litz', of bunched single strands. A special line filter was supplied which gave rise to some test problems in the lab but which was fine for the auditioning. The unit came supplied with matching solid core interconnect cables.

Sound quality

On an overall basis this pre-amp rated 'good plus' on the listening tests, encouraging, but unexceptional in the context of a fairly expensive pre-amplifier. Both input sections were rated equally well, its strong points including a nicely balanced frequency response, a subtle but 'different' high frequency register, well focused stereo images, plus good width and staging. Far depth effects eluded it, though ambient recordings were handled well. The bass was above average, while the mid was occasionally a trifle 'rich'; it gave a good impression of detail on solo passages, but was less articulate on complex material where some veiling was observed.

Lab results

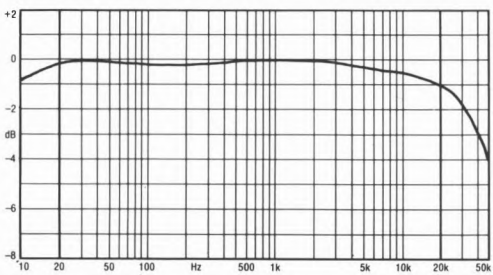
Reflecting a low-feedback design approach, the harmonic distortion results were rated as satisfactory, and they varied little over the various inputs and frequencies. Similar results were obtained on high frequency intermodulation. Noise results were very low throughout and were complemented by sensible sensitivities. Moving-coil overload margins were fine, although via the auxiliary input the bounded upper frequency overload limit was surprising.

Channel separation was much better than average, reflecting the careful construction. However, the balance control was biased by 0.75dB in favour of one channel, and needed a control shift to correct this. The output impedance was low enough to drive considerable cable runs, and the voltage headroom was also ample.

Conclusion

This promising pre-amplifier was quite presentable in its own right, but was not strong enough

to compete with the broad field represented in this issue. The overall standard was pretty high however, and in view of the price, this does make it worth considering. A significant quality which may influence an intending purchaser in its favour could be its freedom from 'solid state' subjective hardness or 'glare'.



Disc input: RIAA equalisation accuracy

GENERAL DATA Pre-amplifier

Distortion

Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−64.1dB	−63.4dB	−56.9dB

Intermodulation, 19/20kHz, rated power, aux input ..... −58.9dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc) ..... −58.7dB

Noise

Disc (mc) input (IHF, CCIR weighted) ..... −71.7dB
Aux/CD input (IHF, CCIR weighted) ..... −84.8dB
Residual, unweighted (volume control at min) ..... −93.8dB
DC offset, pre-amp ..... left 1mV, right 1mV

Input overload	20Hz	1kHz	20kHz
Disc (mc) input (IHF)	30.1dB	29.2dB	10.4dB
Aux/CD input (IHF)	>20.5dB	>16.4dB	>8.6dB

Stereo separation

Disc input (mc)	73.0dB	75.0dB	61.4dB
Aux input	83.0dB	74.8dB	63.6dB

Channel balance, disc, at 1kHz 0.76dB

Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.05dB	0.78dB	0.52dB

Input data	socket type	sensitivity	loading
Disc (mc) input	Phono	0.69mV	100ohms, 1.8nF
Aux input	XLR male	700mV	9.9kohms, 70pF

Output, pre-amp (tape) ..... 16.8V max, 100ohms
Disc equalisation error, 30Hz-15kHz ..... +0dB, −0.75dB
Size (width, height, depth) ..... 28.5 x 7 x 33cm
Typical price inc VAT £666

Denon PMA-707

Hayden Laboratories, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG
Tel (0753) 888447

Each year it seems that there is some new contender for the role of the least expensive budget amplifier to offer respectable sound quality. This time, Denon have entered the fray with the *PMA-707,* priced typically at around £90. The Denon brand has recently been making spectacular headway in the hi-fi cassette deck market, but while recent Denon tuners (the *TU-710* and *TU-750)* have been very highly rated in previous editions of *Hi-Fi Choice*, historically the company has not been particularly well known in the UK for its amplifier designs. No doubt the distributors are hoping that the *PMA-707* will put this right!

Immaculately finished in the now almost obligatory satin black, the *'707* is a compact integrated amplifier, with a rated power output of 25W per channel into 8ohms, both channels driven. As might be expected, the clearly-lettered front panel offers just basic facilities — a headphone outlet is provided via the usual ¼in front-panel jack socket, and there is provision for connecting two sets of speakers and two tape decks, with facilities for cross-dubbing between the two.

Other inputs include those for analogue disc (moving-magnet only), Compact Disc/video and tuner. Speaker terminals are simple spring-clip devices, while inputs are via the usual array of RCA phono sockets. The disc input may be used with or without a 12dB/octave subsonic filter, this operating below 16Hz. Finally, the single tone control offers a useful 'loudness' enhancement if desired.

Inside, this amplifier was better built than one might have expected at the price, with through-flow internal heatsinking, plus two generous 1000μF reservoir capacitors. The output stage is direct coupled complementary bi-polar, with an integrated driver chip. The moving-magnet analogue disc input RIAA equalisation is based around a low-noise integrated circuit, a dual channel device, and a straightforward single board construction is used, with a generously sized power transformer.

Sound quality

On the listening tests, the *707* scored a straight 'average' which was a significant achievement considering the price. Peak sound levels reached a surprising 102dBA into 8 ohms, with a fair 4ohm delivery.

On CD, the *707* sounded quite lively and direct, strong on detail but weaker in terms of stereo focusing. A touch of 'grit' was audible in the treble, while the bass was about average in firmness and power.

Some loss in bass quality was observed via disc, with a further loss in focus apparent in the treble. Conversely, the sound retained a

BEST BUY

reasonable level of interest with a generally solid, tidy effect.

Lab results

Power delivery was quite respectable, exceeding 50W peak, with an excellent power bandwidth plus realistic load tolerance and good peak current capability.

All measured distortions were negligible while the noise levels were also very good. DC offset at the power amplifier was fine, with the output impedance as specified. Disc overload was exemplary and the stereo channel separation surprisingly good. The amp remained good on channel balance except at the lowest volume settings.

On the input side, the sensitivities were to a sensible level, while the RIAA disc equalisation was also very good. The *'707* performed well on the 40Hz power test with negligible supply modulation.

Conclusion

This cheerful-sounding amplifier performed well on lab tests; the power delivery was pretty good, and the basic performance was finely specified. A solid, dependable budget amplifier, it rose well above the 'rack system' class, and has achieved Best Buy status in this issue.

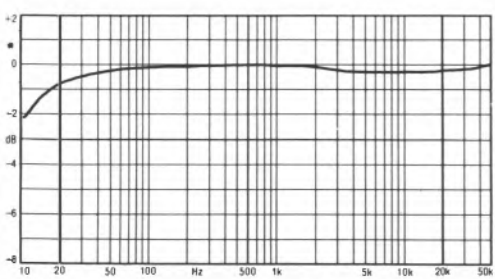
Test measurements

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.

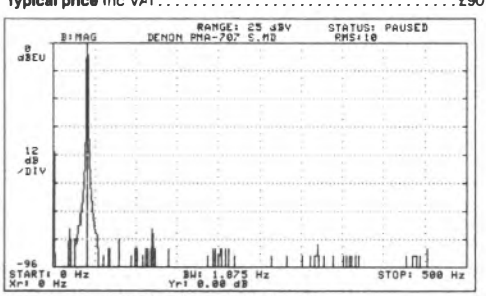
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			25W(=14dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.9dBW	17.0dBW	16.7dBW
Both channels, 4ohm load	13.2dBW	13.6dBW	13.2dBW
One channel, 2ohms, pulsed	—dBW	13.1dBW	—dBW
Instantaneous peak current		+7.6A	−7.2A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−81.0dB	−84.5dB	−69.9dB
Intermodulation, 19/20kHz, rated power, aux input			−81.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−91.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−69.5dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−76.6dB
Residual, unweighted (volume control at min)			−85.4dB
DC output offset			left 2mV, right 11mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	32.2dB	31.5dB	30.8dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	86.2dB	79.7dB	49.4dB
Aux input	87.2dB	75.8dB	49.7dB
Output impedance (damping)	0.15ohm	0.15ohm	0.12ohm
Channel balance, disc, at 1kHz			0.11dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.03dB	0.07dB	3.92dB

Inputdata	socket type	sensitivity	loading
Disc (mm) input	Phono	0.54mV	45kohms, 300pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	Phono	32.5mV	54kohms, 200pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) 9.5V max, —ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.40dB
Size (width, height, depth) 43.5 x 9 x 27cm
Typical price inc VAT £90



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

DNM 2A Series (Primus) and Series 3

DNM Supplies, 42 St Thomas Road, Brentwood, Essex CM1 4DF
Tel: (0277) 225865

DNM is a small British company founded by Dennis Morecroft, a designer dedicated to sound quality and specialising in a range of pre-amplifiers, now well established.

At present packaged in a rather bluff looking alloy case, the range is founded on a basic chassis/motherboard providing signal and power supply interconnection. The various circuit boards plug into this chassis and allow expansion of input and output facilities; linking plugs may also be removed from the back to allow connection of additional power supplies.

Thus the least expensive pre-amp, the *Primus*, supplied with a single power supply unit, forms the heart of the system, and may be expanded internally as well as via additional supplies to a total of three (each of these twin regulated and costing around £350) to become the most expensive model.

The *Primus* is equipped with disc input a choice of mm or mc, plus an auxiliary or direct CD input and the line output amplifiers. Extra input cards may also be fitted plus tape buffer output cards.

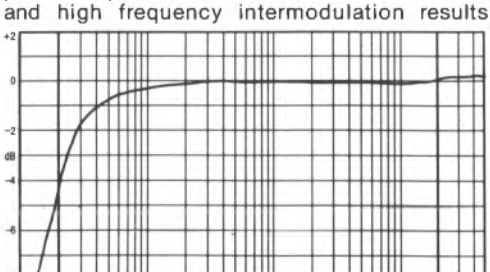
Sound quality

Although the *Primus* version is the cheapest in the series there was no doubt concerning its high audio quality. It sounded confident and clear via the CD input, with a fine exposition of detail throughout the frequency range. Stereo depth and width were well presented. Via mc, the sound was of similar quality. The mid register was pleasantly accurate in tonal balance, rivalling the finest semiconductor pre-amps in this respect, and only in the treble did we note some imprecision, where a touch of fuzz was heard but not judged serious.

Moving up the range the addition of more power supplies in the first *2A* form provided an all-round improvement, in fact the maximum available for the CD input. Still more power supplies progressively improved the analogue disc input performance, with the sound showing more control and confidence, also with an enhancement of dimensional quality. The treble also showed improvement.

Lab results

Up to 4 volts output was available from a low source resistance, which is enough for any power amplifier. The total harmonic distortion and high frequency intermodulation results



Disc eq accuracy

were very fine, and were associated with good input overload margins. Channel separation was also very good and given the dual volume controls, channel balance was also good. Noise levels were fine and sufficiently low for all but the least sensitive of moving coil cartridges.

Conclusion

The *Primus* and *2A* series remain available while a new Swiss-assembled *Series 3*, with acrylic case was also auditioned. After an initial hiccup due to out of tolerance board alignment, the costly *Series 3*, with its special single power supply, outperformed the top *2A* triple supply version and will (presumably) ultimately replace it. From the *Primus* upwards these units deserve recommendation, providing a neutral sound with fine ambience and exceptional clarity.

GENERAL DATA			Preamplifier
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
aux input	– 78dB	– 87dB	– 76dB
Intermodulation, 19/20kHz, aux input			– 100dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			– 95dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			– 95dB
Noise			
Disc (mc) input (IHF, CCIR weighted)			– 64dB
Aux/CD input (IHF, CCIR weighted)			– 88dB
Residual, unweighted (volume control at min)			> – 90dB
Input overload	20Hz	1kHz	20kHz
Disc (mc) input (IHF)*	26dB	27.5dB	29dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	89dB	80dB	67dB
Aux input	95dB	90dB	60dB
Channel balance, disc, at 1kHz			0.03dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	– mV	– kohms – pF
Disc (mc) input*	–	0.1mV	47ohms – nF
Aux input	Phono	85mV	13kohms – pF
Output, pre-amp			4V max, 33ohms
Disc equalisation error, 30Hz-15kHz			+ 0dB, – 1.8dB
Size (width, height, depth)			22 x 11.5 x 13.5cm
Typical price inc VAT			£450 (Primus); £1400 (Series 3)

* *mm input available to order.*

Hafler DH120

HW International Ltd, 3-5 Eden Grove, London N7 8EQ
Tel 01-607 2717

Like the established, larger Hafler power amplifiers, the *DH120* is available either ready-assembled, or in kit form. Self-assembly should be trouble free for those who like to try it, and saves some money into the bargain; we reviewed a factory-assembled sample.

A compact stereo power amplifier, the *'120* is, as the name implies, a 60W per channel unit. Like its larger brothers, it uses a complementary direct coupled MosFet output stage, with good quality components and durable construction.

A central power transformer supplies split rectifier/reservoirs, and output connections are made via 4mm socket/binding posts. The inputs are RCA phono sockets with a variable level control for each channel.

Sound quality

Rated similarly to the larger models previously reviewed, the *'120* scored an overall 'good plus' in the listening tests. Its qualities included a tight, dynamic sound with gutsy bass and a good measure of stereo sound stage and focus.

Driven hard, good sound levels were achieved, but with progressively increasing 'glare' and mid-register hardness. A tidy treble was produced but some loss of air and sparkle was apparent; likewise, while frontal stereo perspectives were fine, it was not sufficiently transparent for one to hear into the far field, or to allow the listener to clearly distinguish low level ambience.

Lab results

Reaching 102dBA sound levels with the test speaker, the *'120* peaked at just a little over its rated power. The loss into lower impedances was modest, though the peak current delivery was not as high as expected, with the 11.5A measured being an average result.

At rated level, the power bandwidth was excellent with the output reflecting a low source resistance. DC offsets were negligible.

All measured distortions were very low including the two-tone high frequency inter-modulation. On the 40Hz power test, the spectrum was singularly free from power supply modulation artefacts.

Channel separation was fine as were the input sensitivity and noise characteristic, while the lower than average input impedance measured 15kohms. Overall frequency response extended from less than 5Hz to 128kHz, −3dB.

Conclusion

This well-built and well designed amplifier gave a generally good lab performance, though I would have welcomed provision for more output current. The specified power rating was not over generous, either.

On sound quality, although the results were

substantially good, in our view they will not set the world on fire at this price level, and accordingly a 'worth considering' rating is merited.

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.

GENERAL DATA Power amplifier

Power output

Rated power into 8ohms, maker's spec	60W (= 17.5dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.6dBW	18.0dBW	17.4dBW
Both channels, 4ohm load	15.8dBW	16.6dBW	16.2dBW
One channel, 2ohms, pulsed	—dBW	16.0dBW	—dBW
Instantaneous peak current		+11.0A	−12.2A

Distortion

Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−81.2dB	−90.8dB	−82.5dB
Intermodulation, 19/20kHz, rated power, aux input			−78.8dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−87.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a

Noise

Aux/CD input (IHF, CCIR weighted)	−94.1dB
Residual, unweighted (volume control at min)	−78.7dB
DC output offset	left 7mV, right 12mV

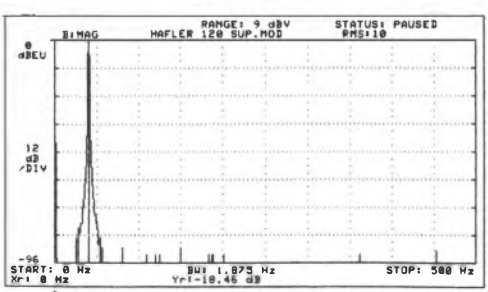
Stereo separation

Aux input	98.8dB	85.4dB	61.3dB
Output impedance (damping)	0.12ohm	0.12ohm	0.37ohm
Channel balance, at 1kHz			0dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	n/a	n/a	n/a

Input data	socket type	sensitivity	loading
Disc (mm) input	n/a	n/a	n/a
Disc (mc) input	n/a	n/a	n/a
Aux input	n/a	n/a	n/a
Power amp	Phono	150mV	15kohms, 420pF

Size (width, height, depth) 39 × 9.5 × 23cm

Typical price inc VAT £360 (kit £295)



Power supply rejection, 40Hz input

Harman-Kardon PM645

Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD
Tel (0753) 76911

Harman Kardon amplifier models have enjoyed a good run of favourable reviews in previous *Hi-Fi Choice* issues, and have been well received elsewhere. The design of the successful *PM-640, '650* and *'660*, models was partly based on research by the designer Matti Otala which indicated a need for higher peak current capability than had previously been thought necessary, to allow an amplifier to drive a 'real' loudspeaker load under dynamic conditions. These original 'high peak current' models have now been updated somewhat, as the addition of '5' to the model numbers indicates, and to represent the latest series we have chosen the *PM-645*.

At around £160, the *'645* enters a crowded and competitive part of the market, but does come fully equipped and very well finished. Built for the American company in Japan (by the Silver Corporation), it is handsomely presented in a pale gold anodised livery. It is rated at 40W (16dBW) per channel and again claims high output current capability as a major design feature, this making it suitable for a wide range of speaker loads. It will also happily tolerate two sets of loudspeakers of more normal impedance rating.

No moving-coil input is present but the remaining line-up of facilities is comprehensive enough. Tone controls are provided together with a headphone outlet and switching for two independent sets of loudspeakers. The 'bass contour' adds 'loudness' compensation, while both subsonic and treble cut filters are present. In addition to CD, tuner and disc inputs, two tape decks may be connected, with the inputs in the usual RCA phono sockets and speaker connection via binding posts.

Inside, a generously sized power transformer is fitted, feeding a complementary, bi-polar, direct coupled output stage. A considerable number of printed circuit boards are used with many cable harnesses, involving long signal paths. It is surprising how complex the construction of a straightforward amplifier such as this can be made. However, the quality of workmanship is high.

Sound quality

Rating a straight 'good' in the listening tests, the *'645* did pretty well, perhaps better than one would have predicted from a view of its interior! It proved capable of good sound levels, contradicting its modest specification, reaching 104 and 103dBA with 8 and 4ohm loads. Slight mechanical hum was however audible. Considered well balanced on both cartridge and CD inputs, it could portray a fair proportion of the depth and ambience in the programme, while its stereo images were stable and well focused.

Bass was generally good if a little lightweight, while the treble quality was well above average.

RECOMMENDED

In the mid the tonal balance was pitched higher than normal with some veiling of fine detail.

Lab results

Confirming the listening results, this amplifier provided almost 95W (19.5dBW) peak into 8ohms, with almost the same available into 2ohms! Superb load tolerance this, with a peak current of 20A available. Power bandwidth was excellent. Distortion levels were moderate and unexceptional, with fine noise levels. DC offset was held to a low level. The output impedance of the power amplifier was negligible throughout the band. Input overload margins were fine while good stereo separation figures were also recorded. There were no problems with channel balance or input sensitivities and their associate impedances.

The power supply modulation result could have been better. RIAA equalisation was however to a good standard, measuring +0.8, −0.3dB, showing some mild bass lift.

Conclusion

This competent amplifier performed well in virtually all aspects of testing. Its output power was rather generous and furthermore it would provide it in a wide range of loads, including double sets of 8ohm loudspeakers. The constructional quality and finish were to the usual high standard and a recommendation is the appropriate outcome.

Test measurements

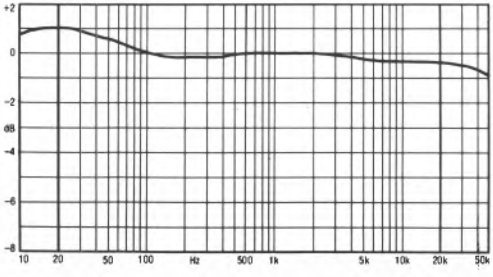
To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			40W(=16dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.0dBW	18.0dBW	17.9dBW
Both channels, 4ohm load	15.2dBW	16.0dBW	15.8dBW
One channel, 2ohms, pulsed	—dBW	19.5dBW	—dBW
Instantaneous peak current		+19.0A	−22.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−62.0dB	−62.9dB	−62.7dB
Intermodulation, 19/20kHz, rated power, aux input			−66.2dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−69.0dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−71.7dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−73.9dB
Residual, unweighted (volume control at min)			−74.5dB
DC output offset			left 12mV, right 5mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	29.3dB	29.5dB	29.5dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	55.0dB*	83.3dB	61.3dB
Aux input	52.3dB*	77.1dB	53.8dB
Output impedance (damping)	0.10ohm	0.10ohm	0.13ohm
Channel balance, disc, at 1kHz			0.52dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.52dB	0.91dB

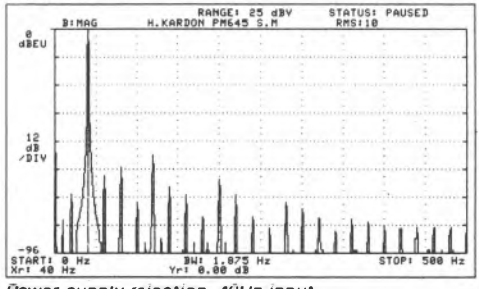
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.35mV	47kohms, —pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	Phono	21mV	—kohms, —pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) ..... 9.13V max, —ohms
Disc equalisation error, 30Hz-15kHz ..... +0.87dB, −0.30dB
Size (width, height, depth) ..... 44 x 10 x 36cm
Typical price inc VAT £159

*inc noise



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Hitachi HA-3

Hitachi Sales (UK) Ltd, Hitachi House, Station Road, Hayes, Middlesex UB3 4DR
Tel 01-848 8787

Placed in the upper price group of the 'budget' amplifier category, the Hitachi *HA-3* is rated at 50W (17dBW) per channel, and offers the standard facilities, omitting such features as a moving-coil input. It is in fact a less expensive brother to the *HA-6* model fully tested in the last issue and now covered in a summary review. The *HA-3*'s well-finished satin black case carries a number of front panel controls — bass and treble adjustment, a subsonic bass cut filter, this set at a rather high frequency of 30Hz, a 'loudness' button and a mono/stereo switch.

Two sets of speakers may be connected and independently selected by front panel switches. The headphone socket is a standard ¼in jack-socket on the front panel. The standard array of RCA phono input connections at the rear caters for disc (moving-magnet cartridge only), tuner, auxiliary/Compact Disc, tuner and two tape recorders. Speaker connections are via simple spring clip terminals.

Inside, the mains wiring is unshrouded. A large mains transformer is fitted, feeding a shared power supply reservoir consisting of two 10,000μF capacitors. The output stage is direct-coupled bi-polar, and the amplifier makes use of a complex integrated output module (STK 4042) to simplify the construction. A Toshiba electronic switch circuit is used to carry out selection of the various input functions.

Sound quality

A disappointing result was achieved by the *HA-3* on listening tests, where the sound quality rated 'poor', with numerical scores which were considerably below the average for the issue. Taken overall, it demonstrated a thin, 'glaring' tonal balance, with a strong two dimensional effect associated with midrange hardness and compression. Stereo depth was virtually absent, while image definition and focus was vaguer than usual. Via disc the mid was still more forced, with an almost agressive attack but no subtlety. Sibilants were slurred, with high-frequency detail more 'fizzy' than transparent. The bass seemed weak, lacking in real substance or extension. Furthermore, at high levels it sounded rather 'loud', in the undesirable sense.

Lab results

The high maximum sound level attained with the test speaker set-up was confirmed in the lab testing for power output where the 8ohm full power rating easily exceeded 100W over the whole power bandwidth and the peak 8ohm level hit 22.5dBW, almost 150W. The peak current was however not commensurate with the power output measured, at as little as 9.3A, curtailing the 2ohm peak output by a considerable 5dB; it worked pretty well into 4ohms though.

A high feedback design, the *HA-3*'s distortion levels were very low, with the intermodulation

exceedingly so. Input levels were excellent. DC output offsets were negligible, as was the output impedance. Disc input overload levels were fine over the frequency range, while the stereo separation was more than satisfactory, if impaired at higher frequencies.

Channel balance was poorer than usual for this class of amplifier. Sensitivities and input impedances were fine, but the RIAA pickup response, held to quite close limits, nonetheless had a 'roller coaster' look to it. However, on the 40Hz power intermodulation test (two thirds power into 4 ohms) the result was quite excellent with almost zero supply harmonics.

Conclusion

Although limited on peak current, given its maximum output capability, the general lab results were fine. Unfortunately, somewhere the sound quality seems to have gone astray, and the listening test results were not inspiring. In our view there are just too many amplifiers that sound better today for this one to be worth considering; perhaps the best thing to say, in conclusion here, is that on the basis of our comparative tests the *HA-3* offers rather more in terms of loudness than it does in subjective sound quality.

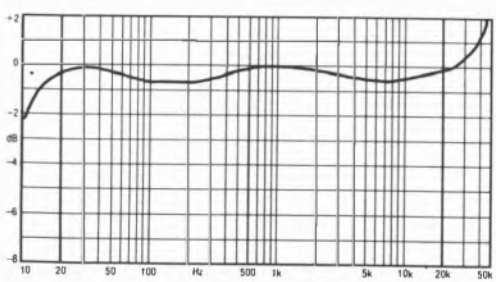
Test measurements

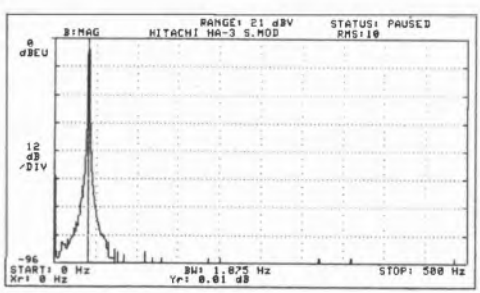
To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB=1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

GENERAL DATA			Integrated amplifer
Power output			
Rated power into 8ohms, maker's spec			50W(=17dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.1dBW	21.1dBW	21.0dBW
Both channels, 4ohm load	17.4dBW	17.7dBW	17.5dBW
One channel, 2ohms, pulsed	—dBW	17.2dBW	—dBW
Instantaneous peak current		+9.3A	−15.4A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−90.6dB	−93.6dB	−80.1dB
Intermodulation, 19/20kHz, rated power, aux input			−99.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−91.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−75.7dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−78.3dB
Residual, unweighted (volume control at min)			−85.5dB
DC output offset			left 8mV, right 7mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30.0dB	29.7dB	28.5dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	70.6dB	66.7dB	50.3dB
Aux input	74.4dB	70.7dB	45.1dB
Output impedance (damping)	0.14ohm	0.14ohm	0.16ohm
Channel balance, disc, at 1kHz			1.05dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.04dB	0.87dB	1.95dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.29mV	43kohms, 180pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	Phono	19.3mV	50kohms, 570pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) 9.54V max, —ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.70dB
Size (width, height, depth) 43.5 x 11 x 30cm
Typical price inc VAT £180





Disc eq accuracy and (right) power supply rejection

JVC A-GX1

JVC (UK) Ltd, JVC House, 12 Priestley Way, Eldonwall Trading Estate, Staples Corner, London NW2 7AF
Tel 01-450 3280

One of the least expensive models tested in this issue, the *A-GX1,* provides a basic specification together with a rated power of 30W per channel. A decade ago this was considered a decent enough output, and speakers were then generally less efficient; so even today in a modern system, good sound levels will be possible, despite the modest price. As always it is worth noting that a slight increase in loudspeaker sensitivity can produce the same increase in sound level capability as a large increase in the number of amplifier watts.

To save on production costs, the construction has been simplified in the *A-GX1* by the use of a hybrid integrated output section, with both power amplifier modules contained in a single module, an STK 4141 11. This is a bi-polar, direct-coupled device fed from a modest pair of 3,300μF reservoir capacitors. The unit is energised by a healthy looking power transformer.

Well-finished in the usual satin black, this amplifier offers a moving-magnet disc input plus selection from CD/video, tuner and tape. In addition, to balance and volume, the panel-mounted controls include a loudness correction button, and tone correction via bass and treble controls.

On the rear panel, the speaker connections (one pair) are made via simple spring clips, while the input connections are the usual RCA phono sockets.

Sound quality

Rated a little below average on listening tests, the sound quality was quite reasonable for the price. It was not very transparent in terms of depth or ambience in the sound stage, but it survived with a competently neutral tonal balance, plus reasonable clarity. Stereo focus was satisfactory with reasonable midband detail. Bass was unexceptional, with some softness and a lack of extension and power. Mild sibilance was noticed in the treble, plus a veiling of detail and a lack of pinpoint focus. Overall, the sound was quite consistent between the disc and CD inputs.

Modest peak sound levels of 100dBA were raised at 8ohms, with a 3dB loss to 97dBA on the more difficult 4ohm loudspeaker loading.

Lab results

Comfortably exceeding the rated power, this amplifier held a 40W level over the power bandwidth, but the output deteriorated quickly into 4ohms, with a 4dB loss. Peak output was healthier, this less dependent on the power supply, and a reasonable 14dBW was achieved into 2ohms, with the associated peak currents at a realistic level at around 10A for both positive and negative signal polarities.

Harmonic and intermodulation distortion results were quite satisfactory, and even with the moderate disc over-load figures of 20dB, the high

frequency intermodulation result was fine at close to 0.1%. In practice, 20dB is a satisfactory overload margin and the extra 10dB often available is only required for certain rare combinations of cartridge and step-up transformer.

At the output, the DC offset was satisfactory at under 50mV while noise levels were fine. It can be seen that the channel separation degraded with rising frequency, to an adequate 28dB by 20kHz and other aspects were also generally satisfactory, including the power modulation results. Deviations from the correct RIAA response were considered acceptably small.

Conclusion

This modest budget amplifier offered realistic peak programme power levels, with sufficient current to drive the majority of 4-8ohm speakers. Most aspects of its technical performance met accepted standards, and while its sound quality was nothing special, it was quite satisfactory at the price. Offering reasonable value for money, the JVC *A-GX1* rates as worth considering.

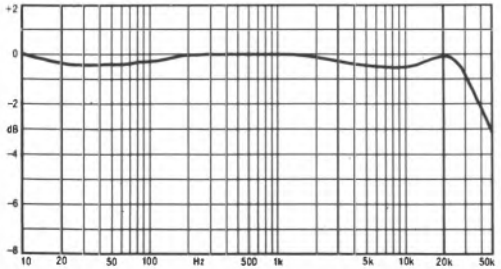
Test measurements

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.

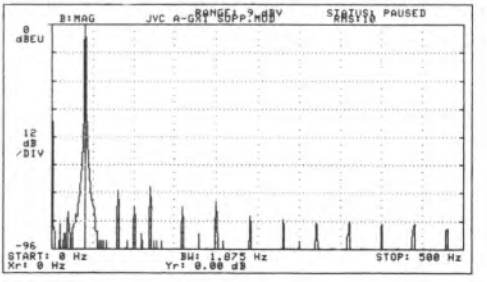
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			30W(=14.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.6dBW	16.4dBW	16.0dBW
Both channels, 4ohm load	10.4dBW	12.2dBW	12.1dBW
One channel, 2ohms, pulsed	—dBW	14.0dBW	—dBW
Instantaneous peak current		+9.5A	−12.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−61.2dB	−64.2dB	−58.1dB
Intermodulation, 19/20kHz, rated power, aux input			−58.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−63.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−65.7dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−79.8dB
Residual, unweighted (volume control at min)			−95.0dB
DC output offset			left 43mV, right 49mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	20.0dB	19.9dB	19.5dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mm)	66.9dB	53.2dB	28.2dB
Aux input	80.4dB	52.9dB	28.0dB
Output impedance (damping)	0.17ohm	0.17ohm	0.23ohm
Channel balance, disc, at 1kHz			0.43dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.51dB	1.46dB	1.12dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.42mV	49kohms, 160pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	Phono	27mV	65kohms, 150pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) . . . . . 3.8V max, 6.5Kohms
Disc equalisation error, 30Hz-15kHz . . . . . +0dB, −0.44dB
Size (width, height, depth) . . . . . 43.5 x 8 x 22cm
Typical price inc VAT £70

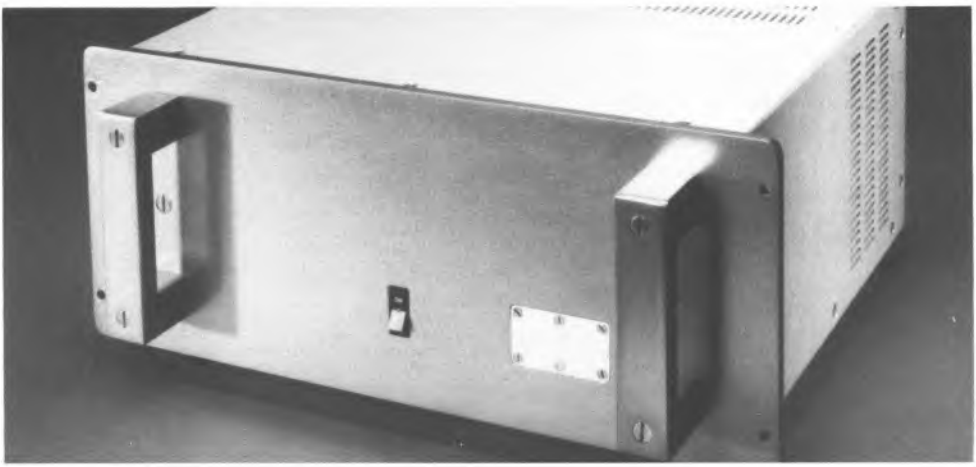


Disc eq accuracy and (right) power supply rejection



Krell PAM5/KSA 50

Absolute Sounds Ltd, 42 Parkside, London SW19
Tel 01-947 5047



Built and finished to the highest standards, the Krell *KSA-50* power amplifier is an expensive American heavyweight, though modestly rated at 50W (17dBW) per channel. Versions at 100W and 200W are also available, and with the exception of the power output, these are broadly similar in performance to the *'50*.

As with the larger models in the series, the *KSA-50* is constructed as a double-mono design, with massive power supplies to each channel. The amplifier runs in pure Class A into 8ohm loads up to its rated power, and employs a forced-air heat dissipator to provide steady thermal conditions as well as a rapid warm up (minutes rather than the usual hour or so for other Class A designs.) The fan is relatively quiet producing no more noise than the large toroidal transformers fitted. The *'50* now benefits from circuit and constructional improvements.

For this edition, we reassessed the *KSA-50* in its latest form and fully tested the matching *FAM-5* pre-amplifier. Brother to the *FAM-3* previously auditioned, the *FAM-5* uses a single external power supply and offers conventional tape facilities. A comprehensive range of inputs is provided, while the overall design conforms to the 'straight line' philosophy. A discrete transistor design, the *FAM-5* includes a special Compact Disc input section with 'programmable phase and frequency' equalisation. Good moving-coil cartridge facilities are also provided.

Sound quality

Re-auditioned for this issue, the *KSA-50* has held its own. It remains a powerful, musical-sounding model, giving good stereo depth and ambience, fine clarity and excellent stereo focus. Tidy and controlled, dynamics were very good, and its high rating position was maintained. The *FAM-5* is a welcome newcomer, in our view now quite to *KSA-50* standard, and a very worthy partner overall. Essentially neutral, the *FAM-5* gave good definition throughout the frequency range with a good measure of 'excitement' and involvement in its sound. The special CD input was rather better than the auxiliary for this signal source, confirming its real worth, and comparably good results were obtained on analogue moving- coil.

Compared with the finest references, the Krells betrayed a mild 'dryness' and a hint of dimensional restriction but the results remained very good.

Lab results

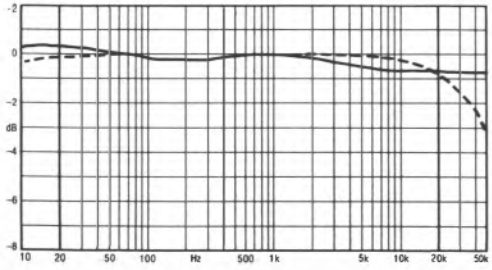
Rated at only 17dBW, the *KSA-50* typically produced on continuous ratings a 19.9dBW output level, and such was the extraordinary power bandwidth that no significant fall occurred from 20Hz to 20kHz, relative to 1kHz. Likewise the loss into 4 and 20ohms was small. Peak output was

approaching 100W, reading 19.9dBW, with 18.2dBW still provided into 2ohms, the Krell proving to have one of the 'stiffest' output and power sections measured. Peak power into 2ohms exceeded 250W. Peak current output was ±32A, which was sufficient for the worst loads.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	50W(= 17dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.9dBW	19.9dBW	19.9dBW
Both channels, 4ohm load	19.7dBW	19.7dBW	19.65dBW
One channel, 2ohms, pulsed	—dBW	18.2dBW	—dBW
Instantaneous peak current		+32A	−32A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−86.0dB	−89.6dB	−72.5dB
Intermodulation, 19/20kHz, rated power, aux input	−89dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	>−80dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	−55.2dB		
Noise			
Disc (mm) input (IHF, CCIR weighted)	−—dB		
Disc (mc) input (IHF, CCIR weighted)	−60.0dB		
Aux/CD input (IHF, CCIR weighted)	−88.0dB		
Residual, unweighted (volume control at min)	>−95.0dB		
DC output offset	left —mV, right —mV		
DC offset, pre-amp	left <1mV, right <1mV		
Input overload			
Disc (mm) input (IHF)	—dB	—dB	—dB
Disc (mc) input (IHF)	20.8dB	20.5dB	21.5dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	43.6dB	66.5dB	43.0dB
Aux input	83.0dB	67.1dB	41.0dB
Output impedance (damping)	—ohm	—ohm	—ohm
Channel balance, disc, at 1kHz	0.20dB		
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.68dB	0.21dB	0.20dB

Input data	socket type	sensitivity	loading
Disc (mm) input	—	—mV	—kohms, —pF
Disc (mc) input	Phono	0.076mV	100ohms, —pF
Aux input	Phono	136mV	9.4kohms, 80pF
Power amp	—	—mV	—kohms, —pF

Outputs, pre-amp (tape) 8.25V max, 11ohms
Disc equalisation error, 30Hz-15kHz +0.30dB, −0.65dB
Size (width, height, depth) 48 × 5 × 29cm, 48 × 21 × 43cm
Typical price inc VAT £1500, £2190



Disc input: RIAA equalisation accuracy

Both pre-, and power amplifier were exemplary on other parameters. Noise level and separation were fine, and all distortions negligible at all levels below clipping. The slightly modified CD response (dotted trace) is shown, together with the substantially accurate RIAA equalisation, the latter slightly tailored for a specific sound.

Conclusion

In addition to the *KSA-50*, the *'100* and *'200* units were auditioned recently, and showed small but progressive improvements as well as greater power. Superbly built, Krell products remain a good investment in listening pleasure .

Both the *KSA-50* and the *FAM-5* are of recommendable quality, despite their high prices. *(Note: Disc input noise performance has been improved since our tests.)*

Le Tube pre-amplifier

Absolute Sounds Ltd, 42 Parkside, London SW19
Tel 01-947 5047

An economic 'minimalist' amplifier of excellent build quality and solid durable finish, this product is designed and made by the small craftsman manufacturing division of *L'Audiophile* magazine, which is based in Paris. Supplied in the UK by Absolute Sounds, *Le Tube* is priced at just under £500 with moving-magnet, tape and aux/CD inputs. A bi-polar head amplifier called *Le Pré Pré* is also available if moving-coil is required, and we managed to fully audition, but not to lab test, this component.

Twin volume controls are fitted and conveniently the inner edges of the knobs are grooved, allowing a rubber 'O' ring to be retro-fitted, effectively 'ganging' the controls for operating convenience.

A separate power supply is used, allowing the amplifier to be very compact and yet free from transformer-induced hum. Inputs and outputs are in phono, with straightforward impedances, promising trouble-free interfacing. Inside, components of selected audio grade quality are fitted and the construction standard is very high.

Sound quality

Early on in the listening tests, this unit established a very good sound quality rating, which held when the exceptional head amplifier was also brought into service.

Depth and ambience sounds were reproduced with authority, the unit distinguished by its 'open' transparent nature. The bass was not quite up to the same standard as the mid and treble ranges which were highly rated for tonality and definition. The sound was direct and explicit with very good stage width and focus, while perspective 'layering' was rendered well.

Both inputs were highly rated and the addition of the head amplifier showed little impairment bar a touch of brightness, a mere hint of upper treble 'grain' and a marginal loss of depth.

Lab results

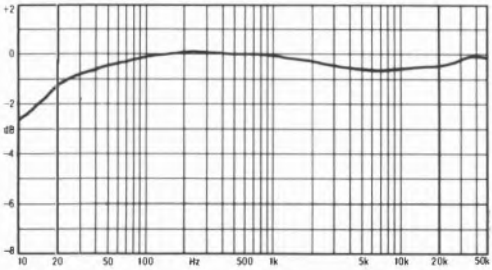
This well engineered product performed well in the lab, with the exception of the distortion results. Set for a modest 0.5V output the high frequency intermodulation was poor, both via disc and auxiliary; however, the figures improved rapidly at lower drive levels. Channel separation was fine and good signal to noise ratios were obtained. The RIAA equalisation met a good standard but could not be classed as entirely neutral (see graph). The −3dB points for the disc frequency response were 9Hz and a high 260kHz.

Conclusion

If moving-coil sensitivity is not required then *Le Tube* will offer a clean view with very good stereo, fine depth and transparency plus a neutral, musical sound all at an economic price. Adding the

RECOMMENDED

head amplifier does lift the cost, but more importantly did not impair the sound. At its competitive price, this well built pre-amp certainly merits recommendation.



Disc input: RIAA equalisation accuracy

GENERAL DATA	Pre-amplifier (separate mc head amplifier)		
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−52.4dB	−51.9dB	−54.3dB
Intermodulation, 19/20kHz, rated power, aux input			−21.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−16.8dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−70.2dB
Aux/CD input (IHF, CCIR weighted)			−79.6dB
Residual, unweighted (volume control at min)			>−90dB
DC offset, pre-amp			left 2mV, right 2mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	25.8dB	27.7dB	21.5dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	12.8dB	11.8dB	11.8dB
Stereo separation			
Disc input (mm)	76.0dB	78.9dB	46.9dB
Aux input	66.6dB	59.6dB	38.3dB
Channel balance, disc, at 1kHz			0.11dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	n/a dB	n/a dB	n/a dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	5.0mV	57kohms, —pF
Aux input	Phono	145mV	230kohms, 70pF
Output, pre-amp (tape)			7V max, 615ohms
Disc equalisation error, 30Hz-15kHz			+0.12dB, −0.75dB
Size (width, height, depth)			20 x 7 x 22cm (12 x 7 x 26cm)
Typical price inc VAT			£480 (Le PrePre, £385)

Linn LK1/LK2

Linn Products Ltd, 257 Drakemire Drive, Castlemilk, Glasgow G45 9SZ
Tel (041) 6340371

In their first amplifier design, Linn have aimed to produce a quality product, one which would be well engineered for production and which would not only match their own top-quality components but would also fit in a number of other hi-fi systems.

Furthermore, they intend it to be 'user friendly', with simple operation and an optional remote control.

The amplifier is presented as a pair of separates, in neat satin-black cases, using bevelled diecast panels. The combination is surprisingly compact, considering that the units are self powered. Rated at a load-tolerant 60W (18dBW) per channel, the power amplifier has fully regulated power supplies and in this respect resembles a mildly down-sized Naim *NAP250*.

The pre-amplifier incorporates electronic selector switching balance and volume control, the latter not a gain-controlled amplifier but a better-sounding ladder attenuator whose steps are selected electronically — thus there are no moving parts. Moving-coil and moving-magnet cartridge disc inputs are provided plus two tape inputs and auxiliary (CD!). The disc inputs are the usual phonos, with a five pin 'XLR' Cannon for tape in/out and three-pin for tuner, aux. and, separately, the main outputs for left and right channels. Linn can supply the necessary interconnect cables.

Using all-discrete circuitry, the pre-amplifier is generously provided with regulated power supplies and high quality selected audio components.

Sound quality

Falling below the 'very good' category in the listening tests, the official tabulated rating for sound quality is the rather clumsy designation of 'good+ +'. The Linn proved to be self-effacing and was pleasantly 'musical', with a nicely balanced mid-treble, free from the usual hardness or glare.

Its good quality held throughout the frequency range and it also sounded quite transparent, revealing a fair measure of ambience and depth. A little 'dark' textured and somewhat restrained, some of the drama and excitement in the test programme appeared to be diluted.

Overall, it lacked subjective extension at the frequency extremes, sounding mildly 'enclosed'. We found that the sound was however commendably consistent throughout on all the inputs.

Lab results

Linn informed us that for future production, the line amplifier gain would be increased by 8dB (x 2.5) while the pickup sensitivity will be increased just 3dB, allowing 5dB more headroom on the overload figures. On the level test, 103.5dBA sound levels were attained, with neg-

RECOMMENDED

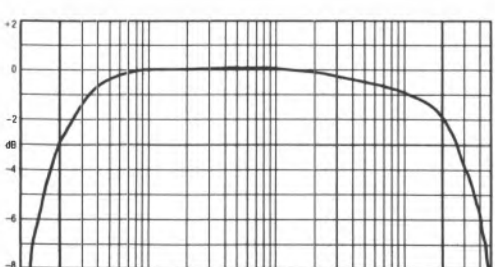
ligible loss into the 4ohm load.

Almost exactly as specified, the power delivery was solid down to 2ohms, with ample 14A peak current. Distortions were low except for the intermodulation results via the disc inputs; the new overload figures will improve upon the tabulated results by around 10dB. The DC offset for the power amp was a little high at nearly a tenth of a volt. Given the adjustable sensitivity and the new headroom, the overload figures are considered satisfactory. Channel separations were fine throughout, while channel balance was generally good, but deteriorated at the −60dB setting. The auxiliary and power amplifier input impedances were on the low side — purchasers should check whether it is suitable for a given pre-amp and signal sources.

On RIAA equalisation, the midband was flat, but overall the rolloffs at the band edges were a trifle premature; I believe these were audible. As might be expected, the power modulation spectrum result was excellent.

Conclusion

The power amplifier is durable, tolerant and also set a sufficient standard for recommendation on both lab test and audition. The pre-amplifier was marginally less successful, but the two succeed in working well together. In view of the facilities offered, the good build quality and overall competence, the combination can be recommended.



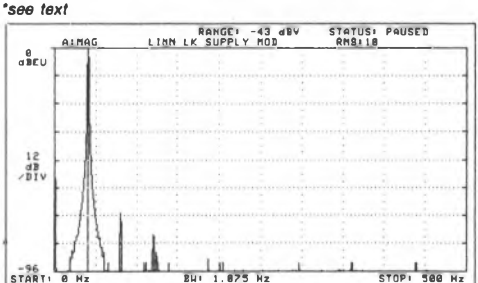
Disc eq accuracy and (right) power supply modulation

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.

GENERAL DATA	Pre-and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	60W(=18dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.6dBW	18.6dBW	18.5dBW
Both channels, 4ohm load	16.4dBW	17.6dBW	17.5dBW
One channel, 2ohms, pulsed	—dBW	18.8dBW	—dBW
Instantaneous peak current		+14.0A	−14.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−68.5dB	−85.6dB	−74.0dB
Intermodulation, 19/20kHz, rated power, aux input			−95.2dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−37.0dB*
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−33.1dB*
Noise			
Disc (mm) input (IHF, CCIR weighted)			−76.5dB
Disc (mc) input (IHF, CCIR weighted)			−71.3dB
Aux/CD input (IHF, CCIR weighted)			−79.2dB
Residual, unweighted (volume control at min)			−84.1dB
DC output offset			left 84mV, right 94mV
DC offset, pre-amp			left 1mV, right 1mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	21.9dB	19.0dB	11.0dB
Disc (mc) input (IHF)	16.1dB	15.6dB	16.4dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	69.8dB	72.0dB	68.6dB
Aux input	88.7dB	87.4dB	65.6dB
Output impedance (damping)	0.02ohm	0.07ohm	0.02ohm
Channel balance, disc, at 1kHz			0.48dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.02dB	5.39dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.75mV	50kohms, 500pF
Disc (mc) input	Phono	0.053mV	150ohms, 11.0nF
Aux input	XLR	133mV	10.0kohms, 220pF
Power amp	XLR	120mV	5.70kohms, 3.5pF
Output, pre-amp (tape)			6.25V max, 28ohms
Disc equalisation error, 30Hz-15kHz			+0.13dB, −1.40dB
Size (width, height, depth)			26 x 8 x 33cm
Typical price inc VAT			£750 (remote control £50 extra)

**see text*



Linx Stratos

HTS Group, Church Road, Lane End, High Wycombe, Bucks HP14 3HH
Tel (0494) 881685

New Zealand is surprisingly active on the amplifier front, their export drive headed by Perreaux, McLaren (a worthy contender but not yet available here) and Linx. In contrast to the first two companies, which have adopted American 'audiophile' styling for their products, the Linx looks European, with a distinctively shaped enclosure using acrylic fascias which are somehow reminiscent of the trend-setting but now defunct Lecson design.

Linx have presented the *Stratos* design as a set of separate components, though the distributors are not at present intending to make the units available separately. The power amplifier is itself divided, to comprise a pair of mono units. The interior design of the pre-amp has also been arranged to preserve a double mono aspect as far as possible. It uses a touch panel for source switching and a large, good-quality volume control. The circuitry is discrete, with fine components in evidence. Both moving-coil and moving-magnet cartridges are catered for, but with a 'straight line' approach — no balance or tone controls are provided.

The power amplifiers are direct-coupled complementary, using parallel pairs of MosFet. Rated at a substantial 120W (21dBW), the amp uses a sizeable power supply with high-current 10,000μF reservoir capacitors and a large screened power transformer. All signal connections are in phono sockets, while the speaker connection (one pair only) is via 4mm socket/binding posts, mechanical hum levels were low.

Sound quality

High sound levels were attained, free from stress of adverse clipping effects up to a measured 108dBA, and with only a small loss into the adverse load. This is certainly a 'big' amplifier.

Overall it did well on audition, scoring 'very good'. Initially very impressive, it portrayed depth well, with a good standard of control, clarity and focus, plus a decent grip on dynamics. Subjectively, it sounded 'open' with a wide frequency range, but tonally there was a hint of hardness and thinness in the upper mid, which occasionally gave a compressive effect. On disc the quality held well with both moving-coil and moving-magnet cartridges, though the latter input was clearly superior. Again the whole effect was of firm control, good focus and a decent rendition of ambience and depth.

Lab results

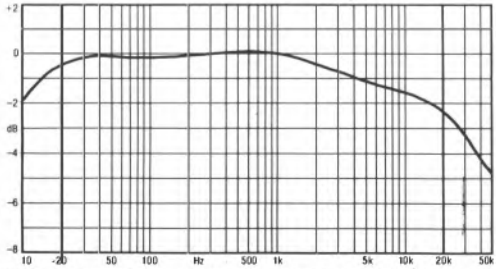
Confirming the high sound levels, the peak programme power reached 200W with very little loss even into 2ohms (22.8dBW here equivalent to 800W true!). The continuous ratings were lower but still good, with fine load tolerance shown by the ±33A peak current available.

On single tones the distortion levels were low but the table showed some weakness on the high frequency intermodulation test at the normal review input levels, notably on the disc inputs. This was due to the reduced input overload margins in the high frequency ranges, but these were ultimately deemed satisfactory, with a strong improvement at lower input levels. Input noise levels appeared to be unexceptional while DC offsets were satisfactory. Given its double mono construction the channel separation was surprisingly average at around 44dB throughout the pre-amplifier! This was queried with the distributor, but our press date arrived before any response was received.

Channel balance was nicely maintained, and the general input characteristics were fine. Looking at the RIAA equalisation, the curve was fine below 1kHz but shelved above 3kHz. On moving-coil (see graph) this loss increased to −2.5dB, which I felt was just a bit excessive. An excellent result was obtained for supply modulation on the 40Hz 4ohm power analysis.

Conclusion

An expensive amplifier, the Linx faces strong competition in the UK market. The sound quality was very good, but not exceptional in its price category. Load tolerance was good, coupled with a massive peak power delivery, and undoubtedly the power amplifiers are the stronger half of the package. Nonetheless the pre-amp, while not quite '100%', still sounded well. Overall a full recommendation is inappropriate; but this is certainly a substantial product worthy of serious consideration.



Disc eq accuracy and (right) power supply rejection

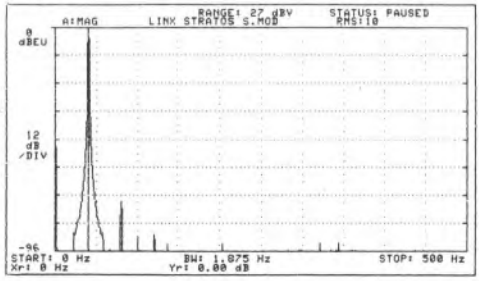
Test measurements

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.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	120W(=21dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.1dBW	21.3dBW	21.0dBW
Both channels, 4ohm load	19.4dBW	19.5dBW	19.3dBW
One channel, 2ohms, pulsed	—dBW	22.8	—dBW
Instantaneous peak current		+33.0A	−34.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−71.9dB	−71.2dB	−70.7dB
Intermodulation, 19/20kHz, rated power, aux input			−59.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−25.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−23.5dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−67.7dB
Disc (mc) input (IHF, CCIR weighted)			−67.0dB
Aux/CD input (IHF, CCIR weighted)			−68.2dB
Residual, unweighted (volume control at min)			−76.3dB
DC output offset			left —mV, right 62mV
DC offset, pre-amp			left 3mV, right 4mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	31.6dB	30.8dB	17.5dB
Disc (mc) input (IHF)	27.4dB	26.5dB	17.4dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	44.6dB	44.6dB	40.9dB
Aux input	45.4dB	45.3dB	45.2dB
Output impedance (damping)	0.02ohm	0.02ohm	0.06ohm
Channel balance, disc, at 1kHz			0.07dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0dB	0.05dB	0.70dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.18mV	47kohms, 250pF
Disc (mc) input	Phono	0.015mV	4.7ohms, 1.20nF
Aux input	Phono	10.2mV	89kohms, 85pF
Power amp	Phono	125mV	42kohms, 1.6nF

Output, pre-amp (tape) 4.84V max, 880ohms
Disc equalisation error, 30Hz-15kHz +0.16dB, −1.93dB
Size (width, height, depth) 24 x 9 x 31cm, 25 x 9 x 30.5cm
Typical price inc VAT £1400, complete



Luxman LV-105

HW International Ltd, 3-5 Eden Grove, London N7 8EQ
Tel 01-607 2717

Although their mainstream products are all transistor, Lux have also maintained a noted presence in the valve amplifier field. Recently they have introduced two interesting hybrid integrated amplifiers, which use a simplified power amp circuit incorporating valve driver stages using a double triode to each channel; the latter are in fact visible via a tinted window let into the front panel. These triodes drive the output stage proper which employs complementary, direct-coupled MosFets. The rest of the amplifier is relatively conventional.

Rated at 85W per channel (18.5dBW), the *'105* is comprehensively equipped, as its price and size suggests. Input facilities include moving-magnet and moving-coil disc, front panel video input sockets, two tape decks, two auxiliaries, CD and tuner. Two sets of loudspeakers may be connected, while the bass and treble controls can be bypassed by a defeat switch. The valves are claimed to have an almost indefinite life, this extended by the use of a standby mode.

Lux see the *'105* as a 'musical' sounding amplifier, intended to integrate with a wide range of modern music sources including tapes and videos. Comprehensive front panel switching allows all of these to be permanently connected.

Speaker connections are via massive binding posts, with inputs via RCA phono sockets. Inside, the usual high standard of Lux construction is evident, but as is common with many Japanese products in this class the internal wiring looks unnecessarily complex.

Sound quality

High 106dBA sound levels were attained at 8ohms, with a still respectable 103dBA into the adverse load, so this is quite a substantial model in power terms.

Rated a straight 'good' in the listening tests, the *'105* produced well-drawn stereo images, showing good width and focus as well as still better ambience and depth. Tonally it sounded pleasantly 'sweet' and 'open', yet 'softened' in the upper mid and lower treble. Dynamics lacked punch, but the bass set a good standard with extension, power and 'speed' all in evidence.

On disc, the moving-coil input sounded significantly worse. The stereo depth and feeling of transparency remained, but the stereo focus lost its sharpness and the dynamics as well as the flow of the programme seemed to be diluted. Difficult to put into words, it sounded a shade 'disconnected' in this mode. Thankfully, mechanical transformer hum was low.

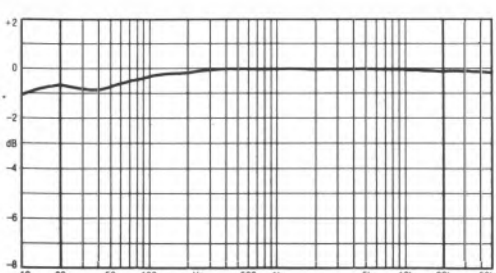
Lab results

Peak 8ohm powers were heading towards 200W though with some limitations on the lower impedances. Peak currents of ±16A were possible;

generally satisfactory. Some kind of protection limited the continuous 4ohm delivery more than was anticipated. Distortion results were fine, while input overload margins and noise levels were unexceptional. There was little to argue about in the rest of the test data, and indeed the result on power supply modulation was exemplary. The graph for RIAA equalisation refers to the moving-coil input and shows just a hint of shelving at low frequencies; the −3dB points were below 7Hz and reached to 160kHz in the ultrasonic range.

Conclusion

Relatively costly, this massive hybrid amplifier is superbly finished and built, with a fully comprehensive set of facilities. In a sense, it managed to capture a 'valve' sound, with an easy musical quality, and yet the bass register was substantially good. Somehow it lacked a degree of excitement and dynamic quality that form an important part of the total performance in this price category. It should not be written off, but in our view fails to qualify for a recommendation in this competitive field.



Disq eq accuracy and (right) power supply modulation

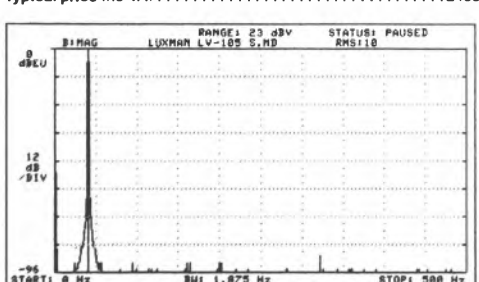
Test measurements

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			85W(=18.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	21.5dBW	21.7dBW	21.3dBW
Both channels, 4ohm load	16.5dBW	16.5dBW	16.5dBW
One channel, 2ohms, pulsed	—dBW	18.0dBW	—dBW
Instantaneous peak current		+16A	−16A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−87.4dB	−79.2dB	−54.2dB
Intermodulation, 19/20kHz, rated power, aux input			−86.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−84.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−86.9dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−71.0dB
Disc (mc) input (IHF, CCIR weighted)			−66.8dB
Aux/CD input (IHF, CCIR weighted)			−75.5dB
Residual, unweighted (volume control at min)			−79.5dB
DC output offset			left 11mV, right 5mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	33.9dB	32.6dB	28.2dB
Disc (mc) input (IHF)	27.9dB	27.5dB	23.7dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	44.6dB	51.7dB	46.9dB
Aux input	73.6dB	70.1dB	47.8dB
Output impedance (damping)	0.2ohm	0.2ohm	0.27ohm
Channel balance, disc, at 1kHz			0.23dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.08dB	0.16dB	0.15dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.26mV	46kohms, 150pF
Disc (mc) input	Phono	0.015mV	665ohms, 0.44nF
Aux input	Phono	16.3mV	98kohms, 100pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 12.8V max, 340ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.83dB
Size (width, height, depth) 44 x 15 x 35cm
Typical price inc VAT £495



Magnum IA-125

AC Magnum Ltd, 65 Daws Heath Road, Thundersley, Essex SS7 2TA
Tel (0268) 778763

Magnum achieved success with their giant *A100* power amplifier, which was reviewed favourably in the 1985 issue and in fact had previously been used as the main amplifier in *HFC* loudspeaker listening tests. Since then, this relatively young company's range has blossomed to a wide grouping which includes their new quality integrated model, the *IA125*.

Rated at 50W per channel (17dBW), this unit conforms to the 'straight line' format, devoid of unecessary complications and without tone controls, balance or filtering. Oddly, perhaps, it does have a stereo/mono switch plus a mute setting. The comprehensive selector switching provides for tape deck, Compact Disc player, and tuner, with disc inputs catering for both moving-magnet and moving-coil cartridges. The input for the latter is said to be self-adjusting in that the cartridge forms the input termination, with some compensating control of sensitivity.

As far as styling is concerned, this model is best described as traditional; the main heatsink is fitted as part of the left hand rear corner, but does look rather under sized in view of the overall power rating.

Output stages are direct-coupled complementary, with a fair-sized power supply energised by a 225VA toroidal transformer. The circuitry is mainly discrete. Input socketry consists of the usual set of RCA phonojacks, while the output connectors are capable of accepting 4mm plugs. The construction on our sample was best described as workmanlike, but a good measure of audio quality components are included.

Sound quality

Achieving a respectable 'good' in the listening tests, this result was however uncompetitive in its price category. A modest maximum sound level of 101.5dBA was achieved into 8ohms, this falling slightly to 99dB at 4ohms. A loud thump occurred with switch-on but mechanical hum was mild.

Considered quite 'lively', it preserved the musical drive in the programme with fair detail and solid stereo focus and staging. The bass was above average while the treble was slightly 'grainy' but despite this, quite good stereo depth was attained. The detail rendition was most evident on simple material, and some degree of muddle was observed with thickly-textured scoring. The sound did show good measure of consistency between inputs, however.

Lab results

The rated power of 17dBW was met with a small margin on 8ohms, but on dual channel 4ohms, the level fell by 2.1dB below the 8ohm result. Peak current in both positive and negative signal directions averaged 12A, which was sufficient for

a fairly healthy 16dBW into 2ohms on pulsed signal. Power bandwidth was poor on the 4ohm load.

With low distortion at bass and mid frequencies, the results were worsened at high frequencies, both harmonic and intermodulation. This was not due to input overload, as the figures there were exemplary. Noise levels were satisfactory, though some imbalance in power amp DC offset was observed. Stereo separation figures were very good while the channel balances were fortunately very fine throughout the measured cycle.

All input sensitivities and impedances were fine. On the 40Hz power spectrum test, the result was above average, the supply breakthrough (harmonics of the 50Hz mains frequency) visible on the vertical marker intervals. The RIAA equalisation was fine, with the response nicely uniform above 50Hz with a degree of subsonic filtering at low frequencies the −3dB point occurred at 16Hz.

Conclusion

Built with music programme demands in mind, rather than to excel on continuous power ratings, and also favouring higher impedance loads, the *IA125* also showed poorer distortion at the higher frequencies, although in truth, this was not very significant. Taken overall it provided a worthy but unexceptional performance, and for the price, neither the sound nor the power level were in our view strong enough to merit recommendation.

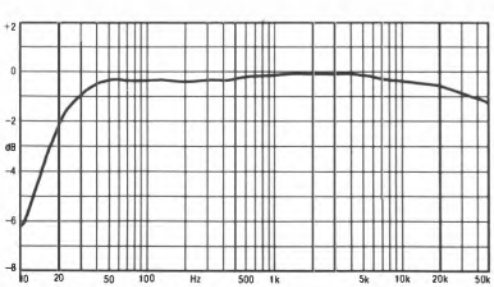
Test measurements

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.

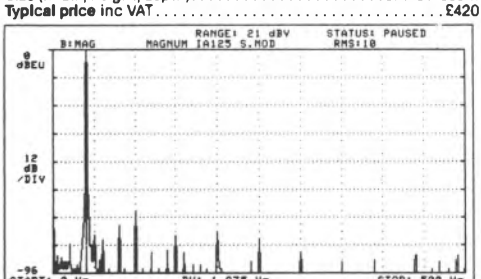
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			50W (=17dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.5dBW	17.7dBW	17.4dBW
Both channels, 4ohm load	14.7dBW	15.6dBW	12.7dBW
One channel, 2ohms, pulsed	—dBW	16.0dBW	—dBW
Instantaneous peak current		+13A	−11A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−70.9dB	−70.9dB	−46.7dB
Intermodulation, 19/20kHz, rated power, aux input			−53.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−53.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−56.1dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−67.3dB
Disc (mc) input (IHF, CCIR weighted)			−65.1dB
Aux/CD input (IHF, CCIR weighted)			−67.3dB
Residual, unweighted (volume control at min)			−73.2dB
DC output offset			left 40mV, right 8mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	39.0dB	38.2dB	37.5dB
Disc (mc) input (IHF)	36.4dB	36.3dB	30.8dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	62.5dB	85.2dB	53.4dB
Aux input	76.7dB	76.0dB	50.6dB
Output impedance (damping)	0.02ohm	0.02ohm	0.03ohm
Channel balance, disc, at 1kHz			0.29dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.28dB	0.36dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.28mV	50kohms, 90pF
Disc (mc) input	Phono	0.02mV	110ohms, 24.5nF
Aux input	Phono	20mV	17kohms, 10pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 8.5V max, 100ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.75dB
Size (width, height, depth) 37 x 8 x 33cm
Typical price inc VAT £420



Disc Input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Marantz PM-84

Marantz Audio (UK) Ltd, 15-16 Saxon Way Industrial Estate, Moor Lane, Harmondsworth, Middx UB7 0LW
Tel 01-897 6633

With their current 'PM' amplifier range, Marantz emphasise the present and future importance of digital audio not only with the front panel designation 'Digital Monitoring', but also with an output stage design claimed to respond particularly well to the dynamic range demands of Compact Disc programme. For the last issue, we tested the promising *PM-64*, which is included in the *Summary Reviews* this time round; for the 1986 test programme, we selected the largest model in the series, the *PM-84*.

In addition to the 'AVSS' circuit common to the *PM-54* and *'64*, the *PM-84* boasts pure Class A operation up to a quarter of its rated power, this being a not inconsiderable 120W (21dBW) per channel; thus 30W per channel Class A performance is provided.

The *'84* is a large model, finished in the currently fashionable (universal? — *Ed)* satin black, and the fascia illustrates its many facilities, these including both tone controls and filters. On the rear panel input and output terminals for two tape decks are provided, along with both moving-magnet and moving-coil disc inputs, plus a good complement of auxiliary, Compact Disc, video and tuner. The amplifier will drive two sets of speakers, these connected via heavy-duty binding posts.

Internal construction is excellent, with massive heatsinking, large high-current output transistors and generous power supplies. The main reservoirs are unusually large at 22,000μF, backed by 8,000μF components for other sections. Selected audio grade components are used, these including the better series of Alps potentiometers. Extensive sub regulation is used in this design, with copper plated shielding and a multi-board construction involving extensive interconnecting harnesses.

Sound quality

The *PM-84* gave a smooth, loud performance, and achieved a substantial 106dBA maximum sound level into the 8ohm test load, this falling 3dB into 4ohm loads. Scoring a straight 'good' on the listening tests, it was best via CD, providing a fairly open and lively sound, with respectable stereo focus and decent bass. Ambience was quite well presented but the full programme depth was not achieved. The treble was quite good if not completely clear or defined, while some loss of dynamic impact was noted.

Via analogue disc, the smooth impression remained — if anything, the sound was too rich. Generally tidy and powerful, with fair depth effects, the treble showed a hint of grain, and appeared a little exposed compared with the rest.

Lab results

The fine power supply design was confirmed by the excellent result for the 40Hz power analysis into 4ohms, seen in the graph. The high specified

output of 21dBW was easily met on test, with the amplifier providing 200W peak 8ohms. However, protection limited the output into impedances below 4ohms, with a loss in level of 8dB into 2ohms. Peak currents of ±13.5A were measured and higher currents were possible but with waveform breakup. The distortion results showed negligible residuals on all tests. Signal to noise ratios were also very good. At the outputs the DC offset was very small, while the output impedance was again negligible. Good channel balance was maintained while the input overload margins were ample.

Channel separation was fine at low to mid frequencies, but deteriorated somewhat in the treble. All the input characteristics — sensitivity loading, impedance — were fine. The RIAA equalisation was found to be very flat up to a few kHz, and then decayed gently towards 20kHz. The −3dB points were 8Hz and 45kHz.

Conclusion

This was a powerful amplifier into higher impedances, offering an easy, musical tonal balance, plus generally good sound quality. No real problems were encountered on tests, the finish and build quality were high and the facilities were generous. Set against price, this was a fair result but not competitive enough for a recommendation.

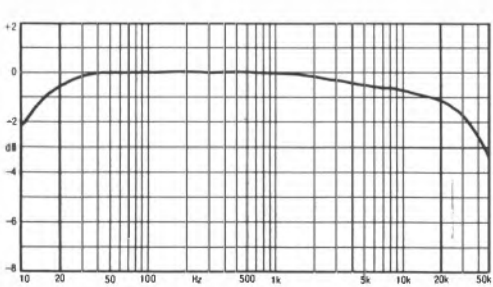
Test measurements

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.

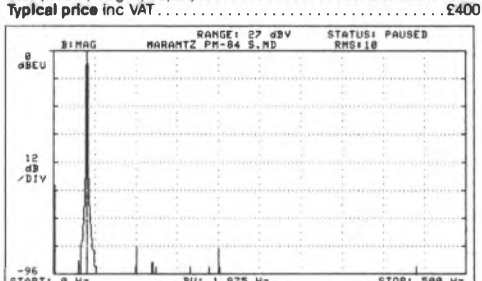
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			120W(=21dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	22.8dBW	22.9dBW	22.4dBW
Both channels, 4ohm load	19.8dBW	20.0dBW	19.8dBW
One channel, 2ohms, pulsed	—dBW	15.5dBW	—dBW
Instantaneous peak current		+13A	−14A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−81.0dB	−80.3dB	−72.4dB
Intermodulation, 19/20kHz, rated power, aux input			−93.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−89.2dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−86.9dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−71.2dB
Disc (mc) input (IHF, CCIR weighted)			−68.0dB
Aux/CD input (IHF, CCIR weighted)			−72.4dB
Residual, unweighted (volume control at min)			−79.4dB
DC output offset			left 6mV, right 3mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	33.9dB	33.2dB	31.5dB
Disc (mc) input (IHF)	34.4dB	33.3dB	32.4dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	79.4dB	61.6dB	34.7dB
Aux input	74.6dB	58.6dB	32.9dB
Output impedance (damping)	0.15ohm	0.15ohm	0.17ohm
Channel balance, disc, at 1kHz			0.46dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.47dB	0.73dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.22mV	47kohms, 100pF
Disc (mc) input	Phono	0.024mV	99ohms, —nF
Aux input	Phono	14.8mV	88kohms, 350pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 14.6V max, 65ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.95dB
Size (width, height, depth) 42 x 16.5 x 45cm
Typical price inc VAT £400



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Mentmore M-100

Mentmore Industries, 24 Mentmore Terrace, Hackney Rise, Hackney, London E8
Tel 01-986 4125

Built in a traditional style, these 100W mono-block valve power amps use wire mesh covers and may be obtained in black or (at an extra charge) chrome finish.

Rated at 100W per channel, these units at present employ GEC KT77 output valves (four per channel) but when stocks of these are depleted, the design will be adjusted to use the freely available EL34 alternative. The mains supplies follow a traditional design and are unregulated with 350μF 700V reservoir units (series wired combinations). An input level control is provided and good quality components such as polypropylene input coupling capacitors are used. The mains transformer is also generously sized. Tappings are provided for 4 and 8ohm matching.

Sound quality

Listening tests proceed uneventfully with a general rating of 'good + +' which was respectable, but not exceptional in view of the price. Good power delivery was obtained, peaking at 106dBA into 8ohms and with a quite respectable tolerance on the 4ohm loading. Some mechanical hum was audible.

Stereo images were its strong point, with fine focus and width, pleasing depth and ambience, but some degree of inconsistency in its portrayal of perspectives. The lower mid was rich and mildly recessive, while the upper mid seemed 'formal' by comparison, with a hint of 'glare'. The treble range did not draw attention to itself, but the bass was considered weak and 'soft', lacking real 'slam' or impact with a slow 'heavy' quality. The latter criticism is relative of course, and by normal standards the bass would rate as quite good.

Taken overall it portrayed a good sense of scale and perspective in the programme but tended to a 'valve-like' richness, lacking in dynamic 'speed'.

Lab results

Rated power could not be achieved at 20kHz, and by 4ohms the output at this frequency had decayed to just a few watts for any sensible distortion level. Conversely, it offered a healthy peak current (for a valve design) of $\pm\mu$11.5A in the midband.

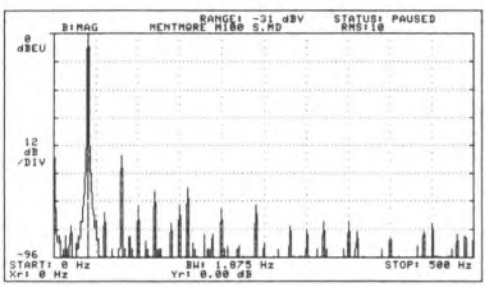
Distortion was generally poorer than average but should not cause undue concern. As is usual with valve models, the output impedance was rather higher than average but not excessively so at 0.6ohms.

In other respects, such as noise and input characteristics, it was fine, while on the power tests taken at a reduced level, some modulation products were evident.

Conclusion

This amplifier offered a mixed performance. The treble rolled off early, removing some air and

sparkle from the sound, while the high frequency power delivery was poor. The stereo reproduction was to a high quality but the bass performance was not in the same league; moreover it is quite expensive. Despite its strengths, it was not in our view sufficiently impressive to merit recommendation.



Power supply rejection, 40Hz input

GENERAL DATA	Power amplifier (mono)		
Power output			
Rated power into 8ohms, maker's spec	100W (=20dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.0dBW	20.8dBW	11.0dBW
One channel, 4ohm load	16.0dBW	16.3dBW	3.7dBW
One channel, 2ohms, pulsed	–dBW	16.4dBW	–dBW
Instantaneous peak current		+11A	–12A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	–48.6dB	–51.9dB	–45.6dB
Intermodulation, 19/20kHz, rated power, aux input			–54.6dB
Intermodulation, 19/20kHz, at 0dBW			–57.4dB
Noise			
Aux/CD input (IHF, CCIR weighted)			–80.0dB
Residual, unweighted (volume control at min)			–n/a dB
DC output offset			left n/a mV, right n/a mV
Stereo separation			
Disc input (mc)	n/a dB	n/a dB	n/a dB
Aux input	n/a dB	n/a dB	n/a dB
Output impedance (damping)	0.52ohm	0.58ohm	0.89ohm
Input data	socket type	sensitivity	loading
Power amp	Phono	61.5mV	94kohms, 130pF
Size (width, height, depth)			25 x 16.5 x 37cm
Typical price inc VAT			£1140 (pair)

Meridian MCA-1 (and pre-amp)

Boothroyd Stuart Ltd, 13 Clifton Road, Huntingdon, Cambs PE18 7EJ
Tel (0480) 57339

In the space available here we cannot do full justice to the new Meridian modular system of electronics. When complete, the range of modules will allow the purchaser to select the combination to meet his requirements. For example, if you only play records you need only buy the amplifier with phono facilities, but modules can be added to give other combinations of multiple inputs, with tuner, tone controls, headphone outputs, and separate power amplifiers.

All the modules clip readily together with automatic electrical interconnection, so there are no trailing wires. The slimline cases are all finished in durable grey Nextel paint.

We tested the *MCA-1* unit, which assumes the role of an integrated amplifier selling at about £440, offering only a single moving magnet disc input; in adding moving-coil and auxiliary input options we brought the total cost to nearer £600.

Internal design of the *MCA-1* is also unusual — the power amplifier has complementary transistor outputs in a double-mono configuration, fed from a balanced input signal. Power supplies use 'flyback transformer' switching and are regulated. The pre-amp itself is designed with balanced signal handling stages based on the use of multiple high quality integrated circuits. The moving-coil input is discrete and employs shunt feedback which gives a 'universal' input with a terminating impedance of 12ohms resistive.

Sound quality

As an integrated amplifier, the *MCA-1* rated a 'good plus' score, and as a pre-amplifier used with more substantial power amplifiers, this improved to 'very good.'

Via moving-coil input, the sound was substantially good, with a clean and articulate bass, a natural and pleasant midband, and quite good treble, the latter suffering from just a hint of 'edge' or 'featheriness'. In stereo image terms it was particularly competent, proving capable of fine natural perspectives with good space and depth, plus much low level detail. The moving-magnet input was generally similar; these input options are in each case dedicated modules rather than 'add on' compromises.

Via aux the sound was still clearer, and slightly more 'open'. The mid treble anomaly remained however. Driven hard the amp did not clip well, and sounded a little 'small', while heavy drive into the adverse load constrained the maximum level to a modest 97.5dBA. The pre-amp section could sound better with a

larger power amplifier, where the dynamics were better reproduced.

Lab results

Measured output levels were close to specification, with a good power bandwidth into the 8ohm load. Sufficient peak current, ± 12A, was available to fully drive all the loads on the peak programme tests, while the loss from 8 to 2ohms was moderate at 1.4dB; a good result. Clean, short peaks will be well handled into some of the most difficult loads. Harmonic and intermodulation distortion results were fine, and even better at low levels, with the signal to noise ratios particularly good, even though some dc offset was observed at the speaker terminals.

Input overload margins were ample, while the pre-amp could produce decent output levels from a 600ohm balanced or 300ohm unbalanced terminal. Stereo separation was very good, and output impedance negligible, while channel balance was fine and the input characteristics well in order. Disc equalisation was to a good accuracy, with a subsonic rolloff on moving-coil but not on moving-magnet.

Conclusion

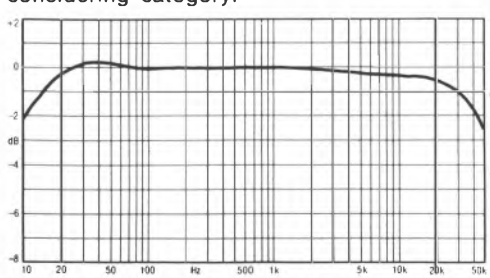
With the latest model tested for this edition, Meridian have continued to make slight improvements to sonic clarity, notably the aux/CD terminal. But despite this, the amplifier has been overhauled by other recent introductions at rather more competitive prices. The 'Component' serious remains a musical and spacious sounding system of considerable merit, but value considerations this time have placed it rather lower in the field, in the 'worth considering' category.

Note: *Meridian have continued to refine the* MCA-1 *and in particular the pre-amp option has held up well in the field. In context the pre-amp is therefore a product worthy of recommendation.*

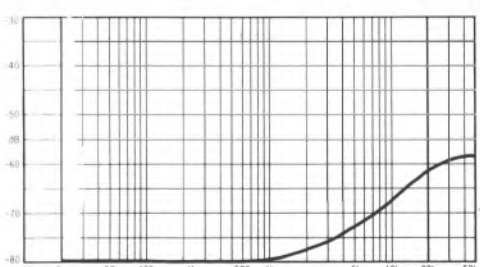
GENERAL DATA			Pre- and power amplifier
Power output			
Rated power into 8ohms, maker's spec			35W(= 15dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	14.6dBW	15.5dBW	14.2dBW
Both channels, 4ohm load	12.4dBW	12.8dBW	11.4dBW
One channel, 2ohms, pulsed	14.2dBW	14.1dBW	14.0dBW
Instantaneous peak current		+ 12 A	– 11 A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	– 88dB	– 84dB	– 85dB
Intermodulation, 19/20kHz, rated power, aux input			– 77dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			> – 80dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			> – 80dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			– 84dB
Disc (mc) input (IHF, CCIR weighted)			– 76dB
Aux/CD input (IHF, CCIR weighted)			– 94dB
Residual, unweighted (volume control at min)			– 87dB
DC output offset			40mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30dB	29dB	30dB
Disc (mc) input (IHF)	24dB	23dB	22dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	– 80dB	– 78dB	– 58dB
Aux input	– 80dB	– 82dB	– 61dB
Output impedance (damping)	0.06ohm	0.05ohm	0.10ohm
Channel balance, disc, at 1kHz			0.5dB
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.1dB	0.1dB	0.9dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.36mV	50kohms, 100pF
Disc (mc) input	Phono	*	12ohms, 0nF
Aux input	Phono	24.4mV	49.5kohms, 130pF
Output, pre-amp			>6V 600/300ohms
Disc equalisation error, 30Hz-15kHz			+ 0.2dB, – 0.3dB
Size (width, height, depth)			480 x 6 x 31cm
Typical price inc VAT			£375 (disc only)

**Cartridge-dependent*

***Typical price** inc VAT.....£440, pre-amp only £240*
(for single input, mc, mm or CD/tape)



Disc input: RIAA equalisation accuracy



Disc input: stereo separation

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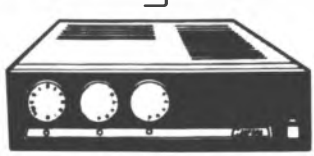

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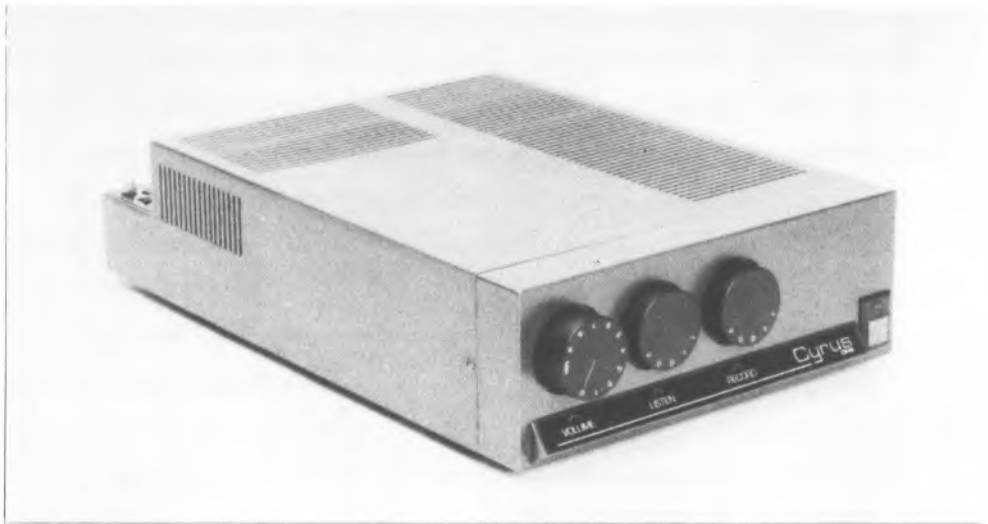
Mission Cyrus One

Cyrus Electronics Ltd, Stonehill, Huntingdon, Cambs PE18 6ED
Tel (0480) 57477



The distinct resemblance in appearance between the *Cyrus One* and the now deleted *778* is not accidental. However, almost nothing of the *778* remains as regards internal design, for the *Cyrus* represents a new approach on the part of Mission's designer, in returning to normal transistors (rather than MosFets) for the output stage. Rated output is a modest 30W (14.5dB/W) while the amplifier is also distinguished by the inclusion of a variable gain disc input that is quiet enough to carry out a reasonable job with medium output moving coil cartridges.

Largely constructed from plastic casings, this design is particularly compact. Input facilities are comprehensive (all phono sockets) and it also has a versatile 'record out' selector which can delete the recorder from the signal path when not in use.

Inside, the direct coupled complementary output amplifiers are fed from a single dual rail power supply energised by a good quality toroidal transformer.

Fast 15A output transistors are used with a 70MHz 'ft.' No line amplifier is present; instead the power amp is run at a higher than usual gain while the line inputs are fed directly to the medium impedance volume control.

The disc amplifier is based on a 5334 integrated circuit, with evident use of high quality metal film resistors and selected audio grade coupling capacitors.

Sound quality

Almost from the outset, the high sound standard set by the *One* was well appreciated. Here was a musical, transparent amplifier of adequate size and which conveyed a decent measure of depth, space and ambience in the stereo sound stage. Focusing was good, and its overall character was relatively neutral, remaining so throughout its usable and surprisingly wide dynamic range. Moderate clipping overload seemed to hardly affect it.

Via disc, very little deterioration was noted. The clean, confident and slightly lightweight character remained; such a performance in fact came close to rivalling some of the costly recommended separates.

Lab results

The specified rating was comfortably exceeded, with a peak power of 17dBW into 8 ohms and a full power bandwidth 'cruising'

power of almost 16dBW (40W). Fully driven into 4 ohms, the power supply sagged with the level down to 13dBW overall. The 12.5dBW output into 2 ohms was reasonably healthy coupled with a decent + 11, – 10A peak current.

All the distortion results were exemplary. Input noise levels were generally good except on mc, where the – 58dB recorded could be considered marginal; OK only for the healthier-output models such as the Ortofon *MC10 Super*. DC offsets were negligible, while input overload margins were fine. Channel separation was strangely and deliberately just average at around 45dB, though this did not appear to spoil the sound!

Channel balance was very good, with a uniform RIAA equalisation showing just a touch of bass and treble cut. A subsonic filter was included. Note that the disc input impedance remained constant regardless of the mc or mm operation. The auxiliary setting was well matched to CD sources. Ripple rejection was just average at – 84dB judging by the 40Hz 4 ohm power spectrogram.

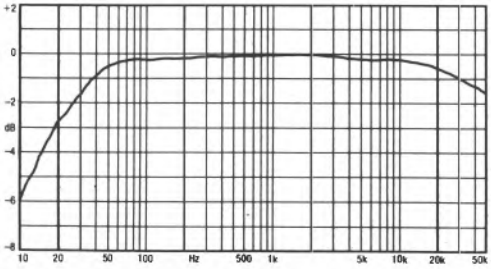
Conclusion

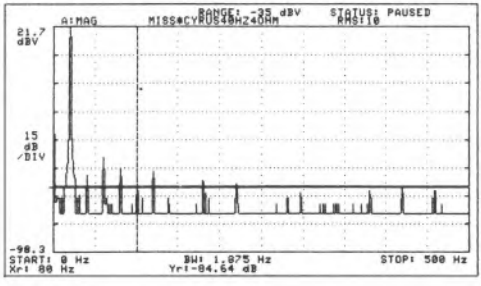
Reauditioned for this issue, the 1986 version showed some detail improvements including better bias tracking. Whatever the reason the *'One'* has again moved upwards with listening test scores indicating a 15% sonic improvement, and this was rather surprising. Once warm (5-10 minutes) the amplifier establishes the reference standard for its category. Dynamic and musical, it won't compromise even an expensive audio system and as a strong Best Buy, is very hard to fault.

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			25W(= 14dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.9dBW	16.5dBW	16.3dBW
Both channels, 4ohm load	13.0dBW	13.7dBW	13.4dBW
One channel, 2ohms, pulsed	—dBW	12.5dBW	—dBW
Instantaneous peak current		+ 11A	– 10A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	– 90dB	– 92dB	– 72dB
Intermodulation, 19/20kHz, rated power, aux input			– 90dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			– 90dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			– 90dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			– 72dB
Disc (mc) input (IHF, CCIR weighted)			– 58dB
Aux/CD input (IHF, CCIR weighted)			– 77dB
Residual, unweighted (volume control at min)			– 75dB
DC output offset			left 6mV, right 7mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	31dB	28dB	28dB
Disc (mc) input (IHF)	30dB	28dB	28dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	– 47dB	– 47dB	– 48dB
Aux input	– 42dB	– 43dB	– 42dB
Output impedance (damping)	0.05ohm	0.05ohm	0.06ohm
Channel balance, disc, at 1kHz			0.2dB
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.5dB	1dB	3dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.4mV	47kohms 280pF
Disc (mc) input	Phono	0.04mV	47ohms 280pF
Aux input	Phono	64mV	—kohms —pF
Power amp	—	—mV	—kohms —pF
Output, pre-amp			—V max, —ohms
Disc equalisation error, 30Hz-15kHz			+ 0dB, – 1.6dB
Size (width, height, depth)			21 x 9 x 34cm
Typical price in VAT			£140

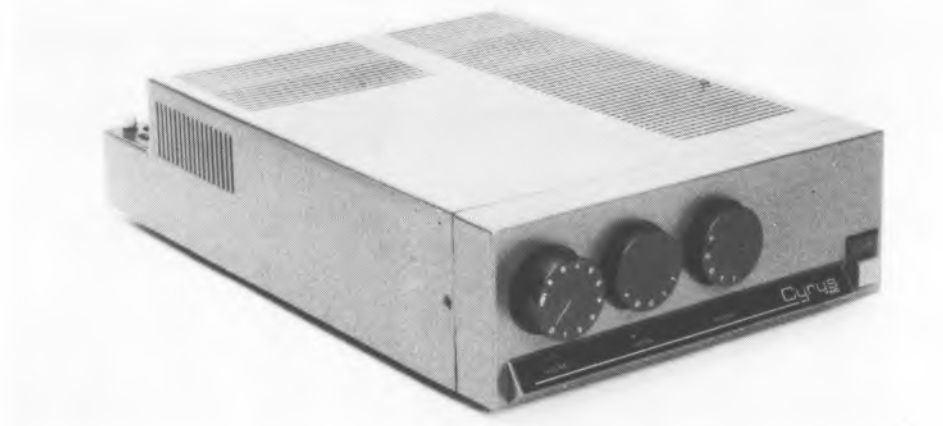




Disc eq accuracy and (right) power supply rejection

Mission Cyrus Two and PSX

Cyrus Electronics Ltd, Stonehill, Huntingdon, Cambs PE18 6ED
Tel (0480) 57477



Mission's *Cyrus One* and *Two* look very similar but important internal differences distinguish them, as well as the matter of some £100 sterling! For the *Two*, the output level has been increased to 50W (17dBW) and output current has also been doubled. Higher quality components are used while the disc stage has also been extensively upgraded to produce a 11dB improvement in noise level via mc with optimised input loading.

As before, two large selector switches dominate the front panel, one for the sources and the other for record 'out'. No balance, tone or any other controls are present, save for volume.

The internal construction follows the *'One*, using a single printed circuit board, plus a large Holden and Fisher toroidal mains transformer. The direct coupled output uses fast complementary output transistors in classic class A/B mode while the single power supply is shared between the channels. Input connections are phono, the speakers joined by large 4mm socket/binding posts which are located rather too close together. Mains input is via an IEC socket and matching cable, while a headphone outlet is also present, this located on the back panel. This is not as inconvenient as it sounds, since the rear panel is an accessible horizontally disposed ledge.

Sound quality

One word sums up this remarkable amplifier, impressive! Good as the *Cyrus One* undoubtedly is, the *Two* was in another class altogether. The sound stage was spacious and deep, showing fine ambience, focus and breadth. It was transparent and produced much fine detail, remaining neutral and highly confident over the whole frequency range. It could also be driven hard without audible distress.

Maximum sound levels of 103dBA and 101.5dBA into an adverse load were obtained and it also clipped well. Via disc the fine quality held up well. In tonal character it was slightly bright with a touch of mid thinness, but it lacked the usual hardness or brittleness often encountered with moderately priced gear. It could also do fair justice to some substantially good cartridges such as the van den Hul *MC10*, costing as much as the amplifier!

Lab results

Producing close on 18dBW on peaks, the *'Two* happily drove the 8 ohm load to 17.6dBW over the test power bandwidth. A significant 3dB loss in level was noted into 4 ohms, both channels driven, suggesting the transformer could be larger (a special booster pack is now available — the optional *PSX).* The pulsed

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rating on 2 ohms showed a little more than 2dB loss, confirming the worthwhile peak current rating of +22.5, −17.5A. The current asymmetry would be advantageous if reversed in polarity. It showed good load tolerance.

Both types of measured distortion were very low, particularly the high frequency intermodulation. Input noise levels were fine, including moving coil while the dc offset at the speaker terminals was held to a satisfactory level. Input overload levels were also ample, and the overall output impedance held to a negligible value. As with the *'One*, channel separation was held at a constant but satisfactory average of 45dB, but a channel imbalance of 1.8dB was noted on disc, although this was said to be atypical.

Volume tracking was fine except at low settings and a better potentiometer would be an advantage here. All input loadings and sensitivities were to a sensible standard, while disc equalisation was accurate with a subsonic rolloff plus a touch of HF rolloff.

The value of the 40Hz power spectrum is not yet well established, and here the *Cyrus Two* was unexceptional.

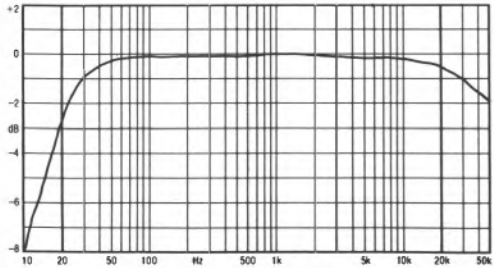
Conclusion

Reassessed for this issue the Cyrus *Two* provided an improved performance and remains quite exceptional in sound quality terms. Adding the *PSX* (a larger, separate power supply for the power amp section) we have a pre- and power-amp combination of slightly greater power delivery and a still better sound, and in this guise the Cyrus is edging towards true audiophile territory, but still at a realistic price. The Cyrus *Two* commands a top Best Buy rating while the *PSX* system is also strongly recommended.

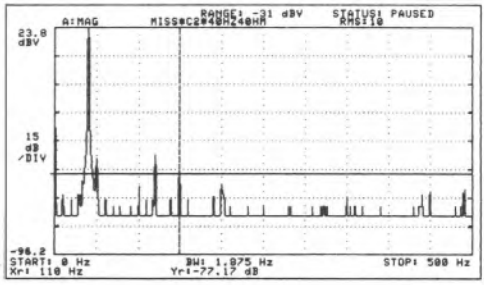
Test measurements

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.

GENERAL DATA	Integrated amplifier		
Power output			
Rated power into 8ohms, maker's spec	50W(= 17dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.7dBW	17.8dBW	17.6dBW
Both channels, 4ohm load	14.4dBW	14.7dBW	14.6dBW
One channel, 2ohms, pulsed	—dBW	15.4dBW	—dBW
Instantaneous peak current		+22.5A	−17.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−85dB	−80dB	−75dB
Intermodulation, 19/20kHz, rated power, aux input	> −90dB		
Intermodulation, 19/20kHz, at 0dBW, disc(mm)	> −90dB		
Intermodulation, 19/20kHz, at 0dBW, disc(mc)	> −90dB		
Noise			
Disc (mm) input (IHF, CCIR weighted)	−76dB		
Disc (mc) input (IHF, CCIR weighted)	−69dB		
Aux/CD input (IHF, CCIR weighted)	−80dB		
Residual, unweighted (volume control at min)	−73dB		
DC output offset	left 26mV, right 13mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	38dB	36dB	36dB
Disc (mc) input (IHF)	26dB	23dB	23dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	47dB	47dB	46dB
Aux input	43.5dB	43dB	42dB
Output impedance (damping)	0.15ohm	0.15ohm	0.15ohm
Channel balance, disc, at 1kHz	1.8dB		
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.06dB	0.1dB	5.0dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.33mV	47kohms 260pF
Disc (mc) input	Phono	0.023mV	470ohms 7pF
Aux input	Phono	60mV	14kohms 300pF
Power amp	—	—mV	—kohms —pF
Output, pre-amp (tape)	75V max, 700ohms		
Disc equalisation error, 30Hz-15kHz	+0dB, −1dB		
Size (width, height, depth)	21 x 9 x 34cm		
Typical price inc VAT	£260 (£460 with PSX)		



Disc eq accuracy and (right) power supply rejection



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Musical Fidelity Ltd, Unit 34, Sapcote Trading Estate, Dudden Hill Lane, London NW10
Tel 01-451 7555

With a rated output of 20W per channel, the Musical Fidelity *A1* is one of the smallest amplifiers tested in this issue, and yet its price exceeds £200. In return however it sets out to offer a high standard of sound quality, based primarily on the particular output stage configuration, namely full Class A. Enough standing current flows continuously through the output stage to always meet the rated load demand. To help dissipate the large amounts of heat generated, the whole of the top surface of the amplifier is a finely finned radiating surface, finished in satin black.

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, as well as the related loadings.

With the input stage executed in integrated circuits, the bi-polar output stage is direct-coupled complementary. The power supply is shared between channels and energised by a well sized 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! I suggested a thermal trip to safeguard against overheating and this is now a production feature.

Sound quality

Performing well in the listening tests, the *A1* could produce higher sound levels than expected — up to a satisfactory 96dBA (4ohms), though higher impedance loads are preferred. Mild transformer hum was noted.

On Compact Disc/auxiliary, this amplifier proved to have a respectable bass quality plus pleasant transparency. Good depth and ambience was present in the stereo sound stage. Well focused, it also possessed a natural, articulate quality.

Via the disc input, the sound quality suffered a little, with less midrange sweetness and some softening in the bass. Via moving-coil, a further loss occurred, and here the bass was disappointingly weak. The characteristic treble delicacy and stereo depth remained, however.

Lab results

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 ±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

RECOMMENDED

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, but the RIAA equalisation was less satisfactory. Both bass and treble were somewhat curtailed, the bass particularly so via the moving-coil input, this heard on audition. Indeed, via moving-coil (solid trace) the bass rolled away below the 100Hz and was already −4dB by 50Hz.

Conclusion

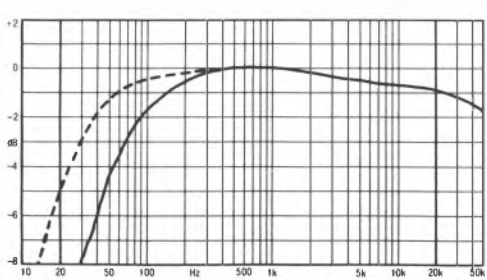
Close to Best Buy territory, the *A1* actually missed this ultimate rating due to its weaker performance on the moving-coil input. At the price, the power level was also on the low side. Conversely, it did live up to its maker's name, providing, sweet, musical and transparent sounds of fine stereo quality. These qualities secured it a firm recommendation.

Test measurements

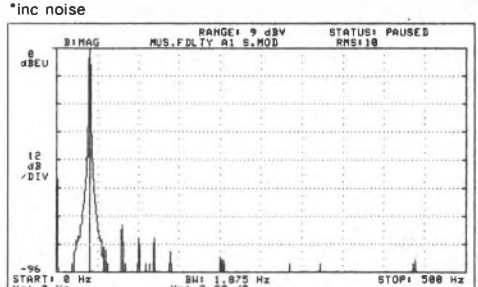
To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

GENERAL DATA			Integrated amplifier
Power output			
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 input	−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 (IHF, CCIR weighted)			−70.0dB
Disc (mc) input (IHF, CCIR weighted)			−67.0dB
Aux/CD input (IHF, 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 (IHF)	21.6dB	29.9dB	29.8dB
Disc (mc) input (IHF)	25.3dB	28.6dB	23.0dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	66.9dB*	92.8dB	65.8dB
Aux input	66.6dB*	93.3dB	68.4dB
Output impedance (damping)	0.37ohm	0.41ohm	0.44ohm
Channel balance, disc, at 1kHz			0.15dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux 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	120ohms, 0.20nF
Aux input		23mV	46kohms, 50pF
Output, pre-amp (tape)			7.5V max, —ohms
Disc equalisation error, 30Hz-15kHz			+0dB, −2.75dB
Size (width, height, depth)			41 x 6.5 x 26cm
Typical price inc VAT			£209

*inc noise



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Musical Fidelity MVT/P170

Musical Fidelity Ltd, Unit 34, Sapcote Trading Estate, Dudden Hill Lane, London NW10
Tel 01-451 7555

These two new products from Musical Fidelity are reviewed together here, but in practice both will also enjoy a strong independent existence. After our main test programme was complete, Musical Fidelity's manaing director Anthony Michaelson sprung a final *MVT* sample on us literally at the last minute — which was perhaps a wise thing to do, as this latest pre-amplifier overturned the review ratings in its favour!

Viewed simplistically, the *MVT* might appear to be effectively an upmarket version of *The Preamp*, but in fact it is rather more than this. Front panel facilities on the *MVT* include a full selector switch plus centre-detent balance control, while the power supply is a substantial outboard unit. The finish is excellent — in appearance, these new Musical Fidelity units almost resemble a sort of British Krell. Input sockets are gold-plated phonos, while the output connections are duplicated in XLR. The *MVT* can also give a phase-inverted output if required.

Providing a visual match for the *MVT*, the *P170* is a slimline 85W per channel (19dBW) MosFet power amplifier, constructed in a true double-mono configuration. The circuitry is a very simple, with moderate negative feedback and an input based an IC op amp.

Phono sockets are used for input, with combined 4mm socket/binding posts on the rear panel for speaker connection. The output stage is direct-coupled complementary.

Sound quality.

The *P170* established a strong position in the listening tests, well ahead of the *Studio T*, for example. Relaxed and spacious, it was clearly powerful, yet clean and controlled. Stereo images were well resolved with fine focus and pleasing depth. 'Grainy' and veiling effects were held to small levels while the bass performance set a competent standard.

The final *MVT* was simply a knockout in its class. Sonically, this unit has suddenly entered the 'big time' of the £2000-plus amplifier systems, with a combination of delicacy and immediacy, dimension and focus which proved beguiling. Sounding wide and open, all areas of the spectrum were handled well with first rate perspectives.

Lab report

Taking power amplifier first, the *P170* showed some mild weaknesses at high frequencies and into low impedances, while easily exceeding its

RECOMMENDED

nominal rating on 8ohms with music programme, reaching 150W per channel. It just held spec into 4ohms 1kHz, in fact attaining a true 150W here. Peak current was unexceptioinal, but did not appear to constrain the performance unduly. Distortions were generally good though the high frequency intermodulation result relates to a rather lower power. Stereo separation was very good though the input impedance was rather low at 6.5kohms. At the output, DC offsets were negligible.

The *MVT* pre-amplifier showed excellently low distortion as well as good overload head room. The channels were well balanced, with above average separation and the inputs were sensibly specified with fine signal to noise ratios. Disc RIAA equalisation was accurate while the final output impedance was low enough for long cable runs.

Conclusion

The *P170* acquitted itself well, achieving a fine standard in its price category and a recommendation is clearly in order, particularly for use with kinder speaker loads.

In its latest form, the *MVT* attained audiophile status, proving hard to fault, and then only by comparison with far more costly equipment. At under £1000 this amplifier can take on some of the world's finest and therefore comes strongly recommended.

GENERAL DATA Pre- and power amplifier

Power output

Rated power into 8ohms, maker's spec		85W(= 19dBW)	
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.3dBW	21.0dBW	17.4dBW
Both channels, 4ohm load	17.7dBW	18.9dBW	16.6dBW
One channel, 2ohms, pulsed	—dBW	14.7dBW	—dBW
Instantaneous peak current		+8.0A	−9.5A

Distortion

Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−88.0dB	−94.0dB	−82.9dB
Intermodulation, 19/20kHz, rated power, aux input			−109.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−75.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−69.6dB

Noise

Disc (mm) input (IHF, CCIR weighted)	−77.0dB
Disc (mc) input (IHF, CCIR weighted)	−72.5dB
Aux/CD input (IHF, CCIR weighted)	−93.0dB
Residual, unweighted (volume control at min)	>−90dB
DC output offset	left mV, right mV
DC offset, pre-amp	left 2mV, right 1mV

Input overload

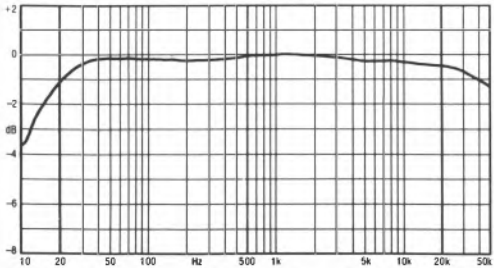
Disc (mm) input (IHF)	32.0dB	31.9dB	31.2dB
Disc (mc) input (IHF)	27.0dB	25.7dB	25.7dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB

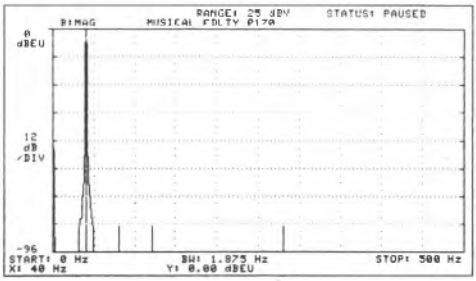
Stereo separation

Disc input (mc)	52.0dB	65.0dB	52.5dB
Aux input	107.0dB	85.8dB	61.4dB
Output impedance (damping)	n/a	n/a	m/a
Channel balance, disc, at 1kHz			0.45dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.27dB	0.25dB	0.48dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	1.78mV	46kohms, 60pF
Disc (mc) input	Phono	0.09mV	94kohms, 25pF
Aux input	Phono	89mV	45kohms, —pF
Power amp	Phono/XLR	n/a	n/a

Outputs, pre-amp 7.8V max, 100ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.34dB
Size (width, height, depth) 48 × 6 × 20.5cm, 48 × 6 × 23cm
Typical price inc VAT £800, £460





Disc eq accuracy and (right) power supply rejection

Myst TMA3

Myst Ltd, The Old Surveyor's Office, Weobley, Hereford
Tel (054431) 8811

With the price held to £250 for 1986, the *TMA-3* is an example of an amplifier built to very high standards but in low production volumes. The company concerned is a small but dedicated one, and have designed this no-frills, low-line integrated amplifier to give a normal-use output of 40W per channel.

Appearance is distinctive, with a cobalt blue case complemented by a satin silver alloy front panel. The controls are reduced to a bare minimum, namely power, volume and just two selector buttons whose various combinations produce tape, tuner, CD and analogue disc. All inputs are in DIN except for disc.

Internal construction is a model of its kind with neat cabling, clear layout, and fully shrouded mains wiring and contacts. Both moving coil and moving magnet cartridges are catered for by plug-in boards, and various loading requirements may be readily met.

A combination of integrated circuit and discrete transistor technology is employed, each where considered appropriate. Via mc the input is a virtual earth or shunt feedback current input, considered by many to be the ideal loading, and an input buffer is placed before the RIAA equaliser stage. The moving-magnet offers the normal cartridge loading.

The CD input bypasses the line buffer and is fed directly to the power amplifier via the volume control. The impedance here is a satisfactory 12k ohms while the normal auxiliary input is higher at 17k ohms.

Remarkably simple, the power amplifier is based on a classic Hitachi circuit, with only five transistors. The output is direct coupled complementary with Hitachi 2SK226/2SJ82 MosFet output devices coupled to the speakers via a 2.5amp quick blow fuse.

Sound quality

Scoring above average the *TMA-3* sounded a trifle lean, even bright in tonal balance terms, but this did not impart noticeable brittleness. Tidy and well integrated in character, it provided moderate depth to the stereo images, and above average focus. The bass was found to lack some definition, and did not throw full 'weight'.

Via disc (mm) the quality held up well, but via mc some additional loss of definition and clarity was observed. It behaved well at full

power into the normal load, providing 102.5dBA, with 101dBA into the adverse load.

Lab results

Rated output was comfortably exceeded, with the peak programme output near to 17dBW (50W) per channel with an excellent power bandwidth shown at 16.7dBW. The output held well into 4 ohms, while the 2 ohm pulsed level was only 2dB below the 8 ohm result. The ±12A peak current was sufficient for the rating, and overall it showed good load tolerance.

Harmonic distortion had deteriorated by 20kHz, here only −50dB at full power with considerable crossover effects. The high frequency intermodulation results were fine however, so distortion was not considered a real cause for concern. Input noise levels were fine while input overload levels were satisfactory. Note that the mc figures relate to EMF at the input and in practice, the shunt design implies much better figures using a real cartridge. Channel separation was above average, while volume tracking was excellent. Above 200Hz, the RIAA equalisation was most uniform, but the subsonic filter rolloff incorporated rolls off a little early in the audible bass register, and may account for the 'light' character via disc.

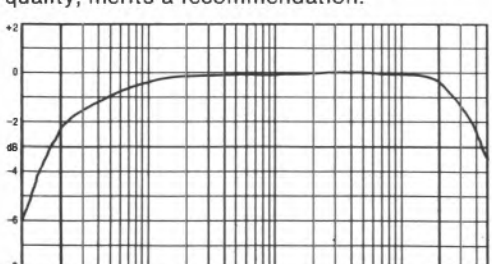
Conclusion

This excellently constructed, compact integrated amplifier, offers well matched inputs, no frills and a dependable performance. Good load tolerance is also demonstrated. It should offer a long life, and this taken in conjunction with the above average sound quality, merits a recommendation.

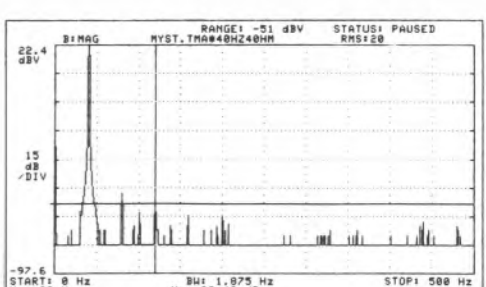
Test measurements

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec.			35W(=15dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.7dBW	16.7dBW	16.7dBW
Both channels, 4ohm load	14.2dBW	14.3dBW	14.3dBW
One channel, 2ohms, pulsed	—dBW	14.6dBW	—dBW
Instantaneous peak current		+12A	−12A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−80dB	−68dB	−50dB
Intermodulation, 19/20kHz, rated power, aux input			−75dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			−77dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			−74dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−66dB
Disc (mc) input (IHF, CCIR weighted)			−66dB
Aux/CD input (IHF, CCIR weighted)			−72dB
Residual, unweighted (volume control at min)			−78dB
DC output offset			left 13mV, right 6mV
DC offset, pre-amp			left nilmV, right nilmV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	20dB	20dB	20dB
Disc (mc) input (IHF)*	10dB	6dB	6dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	>70dB	70dB	64dB
Aux input	77dB	71dB	55dB
Output impedance (damping)	0.095ohm	0.09ohm	0.11ohm
Channel balance, disc, at 1kHz			0.4dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.3dB	0.2dB	0.1dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	63mV	47kohms 200pF
Disc (mc) input*	Phono	see text	see text
Aux input	DIN	40mV	>50kohms 110pF
Disc equalisation error, 30Hz-15kHz			+0.08dB, −0.55dB
Size (width, height, depth)			43 x 21.5 x 6cm
Typical price inc VAT			£250



Disc eq accuracy and (right) power supply rejection



NAD 3120

Hi-Fi Markets Ltd, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737

Following Rotel's lead, the NAD designers have taken a close look at their *3020*, and have obtained a reduction in cost plus improvement in sound quality by throwing some parts away and simplifying the wiring. Essentially therefore the *3120* is a version of the *3020* with the tone controls omitted, as well as the LED power level indicators and the balance control.

Refinements include the fitting of decent 4mm socket/binding posts for speaker connection, while output has been increased into 8 ohm loads. If the load is known to be more arduous, a reduced 4 ohm power setting can be selected but in practice, unless such a load were to be driven flat out indefinitely, the switch might just as well be left on the 8 ohm setting, with the attendant benefits of increased headroom. However if two sets of speakers are to be used in parallel, the 4 ohm setting is advisable.

A nominal moving coil facility is now included, in addition to the usual moving magnet cartridge input, the impedance remaining high for both.

Robustly constructed, this amplifier is built to normal commercial standards. The output remains a direct coupled complementary with metal cased 2N3055/2955 output transistors. Gross thermal overload results in protection via thermal circuit breaker, which is self resetting.

Sound quality

Scores indicated a well above average performance which was a fine result for the price. Via auxiliary it gave an open and lively impression; dynamics were well presented, with a pleasing contrast shown between soft and loud passages. Channel separation was stable and wide, while the transparency was sufficient to portray reasonable depth. On the debit side the bass showed a touch of boom while the mid seemed a little hard tonally and the treble was mildly grainy.

Via disc, a very similar standard was achieved. The stereo focus remained good, while recorded ambience was nicely reproduced despite some observed forwardness in the treble register. Overall it was considered to show a significant improvement over last year's *3020*.

Lab results

Maximum subjectively assessed sound levels

BEST BUY

were noted as 102 and 99.5dBA which tied in well with the lab measured output power, well above the conservative 20W (13.5dBW) specification. Peak 8 ohm power exceeded 50W with a fine power bandwidth seen at the 17.1dBW level. The loss into 4 ohms was mild while the 2 ohm pulsed output was quite generous, and still well above specification. Substantial ±14 A current peaks were allowed so the design remained as load tolerant as ever.

Distortions, both harmonic and intermodulation were negligible. Noise levels were also very good, surprisingly so in fact, via mc. The dc offset was satisfactory while the amplifier's output resistance was typically low. Input overload margins were ample, but stereo separation was at a pretty average level.

Channel balance was fine even on the RIAA equalisation which was also commendably accurate. Channel tracking held to a close tolerance over a wide range.

Input sensitivities and loadings were satisfactory. Assessing the 40Hz spectrogram, the grounding was clearly very good as no mains ripple components could be seen down to the instrument resolution of – 100dB.

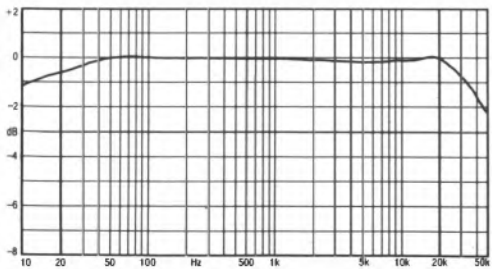
Conclusion

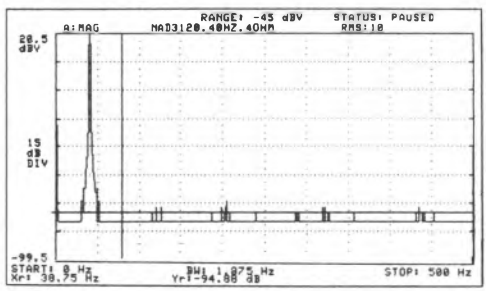
The *3120* performed well on test and re-established NAD's competitive position in this price area. It proved quite powerful with a good adverse load tolerance and could produce well focused ambient stereo images. The price is moderate and in conjunction with its above average quality, indicates that a Best Buy classification is still 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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			20W(= 13.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.1dBW	17.2dBW	17.2dBW
Both channels, 4ohm load	13.7dBW	14.8dBW	14.6dBW
One channel, 2ohms, pulsed	—dBW	14.8dBW	—dBW
Instantaneous peak current		+ 14A	– 14A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	– 83dB	– 91dB	– 76dB
Intermodulation, 19/20kHz, rated power, aux input			– 80dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			– 84dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			– 83dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			– 80dB
Disc (mc) input (IHF, CCIR weighted)			– 73dB
Aux/CD input (IHF, CCIR weighted)			– 80dB
Residual, unweighted (volume control at min)			– 84dB
DC output offset			left 22mV, right 24mV
DC offset, pre-amp			left nilmV, right nilmV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	34dB	30dB	35dB
Disc (mc) input (IHF)*	32dB	33dB	32dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	50dB	46dB	38dB
Aux input	50dB	50dB	45dB
Output impedance (damping)	0.19ohm	0.19ohm	.0.22ohm
Channel balance, disc, at 1kHz			0.2dB
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.5dB	0.3dB	1.6dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.55mV	47kohms 110pF
Disc (mc) input*	Phono	0.038mV	21kohms —pF
Aux input	Phono	28mV	33kohms 100pF
Power amp	Phono	—mV	34kohms 1000pF
Output, pre-amp (tape) 11/DIN			5V max, 1.7kohms
Disc equalisation error, 30Hz-15kHz			+ 0.1dB, – 0.4dB
Size (width, height, depth)			42 x 10 x 24cm
Typical price inc VAT			£119





Disc eq accuracy and (right) power supply rejection

NAD 2200

Hi-Fi Markets Ltd, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737

This ambitious power amplifier is priced in a competitive region around £340, the cost broadly agreeing with its nominal 100W per channel capacity. However, this model is designed to provide undistorted levels on programme dynamic peaks of up to 500W per channel, which, in watts per pound sterling, makes it the power amp bargain of the year! What is more, it is designed to cope with realistically adverse speaker loads at this elevated level. Unbelievably, it may also be switched to bridge mode operation where its continuous rating is 400W into 8ohms, rising to a specified 1,200W on programme peaks!

As we shall see, even these were conservative claims. They are achieved by a direct-coupled complementary output stage, which incorporates additional transistors connected as switches or gates. This allows an additional higher voltage power supply to come into operation for short musical peaks over 140W rated level.

Inside, the construction was clearly of high quality with extensive through-flow ventilation and a logical layout.

Sound quality

The *2200* scored a respectable 'good plus' on the listening tests; a positive result, since only too often such large amplifiers let the side down on audition. It played effortlessly loud, reaching 111 and 109dBA into the 8 and 4ohm speaker loadings. Mild transformer hum was heard on our sample.

The sound was described as dry and controlled, with a good level of instrumental detail and sharp, stable stereo focusing. Ambience was reproduced quite well, but far depth effects were suppressed. Tonally, the mid was slightly nasal and lean while the treble was lacking a little air and sparkle. Bass was pretty good for the class, while the amp 'drove along well', preserving much of the dynamic interest in the programme.

Lab results

Into 8ohms, the peak output reached a massive 27dBW (500W) while in bridge mode (mono operation), 1,600W was attained. Considering the peak levels possible, the output current was sufficient at ±55A. In stereo mode, it is quite load tolerant; 25.5dBW into 2ohms is equivalent to an actual 1,500W per channel peak.

Measured distortions were negligible, and noise levels fine. Output impedance was also negligible, while the channel separation met a fine standard. Tested on a continuous rating, 4ohms, the 40Hz power analysis looked excellent with nothing of interest even at −90dB.

Conclusion

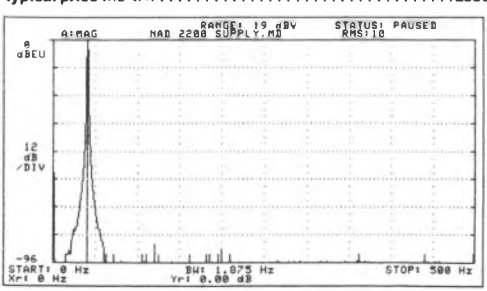
Having survived the critical low level section of the listening tests, the *2200* proved that under real

programme conditions, it was one of the biggest amplifiers ever. A bridged pair would provide a sensational 1,500W undistorted programme per channel, still impressive at 32dBW. The lab performance and build quality were both fine. At the price, it would not normally qualify for a recommendation on sound quality grounds, but the exceptional power output meant that this had to be worth serious consideration — indeed, for certain applications, it may be the only sensible choice!

GENERAL DATA			Power amplifier
Poweroutput			
Rated power into 8ohms, maker's spec.			100W(=20dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	22.8BW	22.9BW	22.8BW
Both channels, 4ohm load	20.9BW	21.0dBW	20.8dBW
One channel, 2ohms, pulsed	—dBW	25.5dBW	—dBW
Instantaneous peak current		+52.0A	−60.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−90.0dB	−86.0dB	−77.6dB
Intermodulation, 19/20kHz, rated power, aux input			−87.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−96.2dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			—dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−83.3dB
Residual, unweighted (volume control at min)			−88.9dB
DC output offset			left 5mV, right 4mV
DC offset, pre-amp			left —mV, right —mV
Stereo separation			
Aux input	110.7dB	83.0dB	59.5dB
Output impedance (damping)	0.06ohm	0.06ohm	0.14ohm
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.13dB	0.13dB	0.15dB

Input data	socket type	sensitivity	loading
Power amp	Phono	76.5mV	22kohms, —pF

Size (width, height, depth) ..... 42 x 12 x 38cm
Typical price inc VAT £339



Power supply rejection, 40Hz input

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Naim NAC32/NAP250

Naim Audio Ltd, Southampton Road, Salisbury SP1 2LN
Tel (0722) 332266

Designed as a system, these Naim components are rarely assessed as separate items. It is probably true to say that their manufacturer has dominated the UK audiophile amplifier area for many years now, and in conjunction with the special power supply *(SNAPS)* for the pre-amplifier, the units here reviewed represent the company's top line models apart from the larger mono *'135* power amps.

The *NAC32* lacks tone controls or filters but can offer moving-coil and moving-magnet disc inputs, as well as tuner and tape. Sockets are mainly DIN, with disc duplicated in gold plated phonos. Both output signal and supply power are sent via the pre-amp power supply, en route to the power amplifier, using special cable and 4-pin DIN connectors. The latest *32/5* version has BNC phono inputs.

Both units are built to an excellent constructional standard, the *250* power amplifier using a refined version of a traditional quasi-complementary circuit, direct-coupled and employing high quality power regulators, these as complex as the amplifier itself. A large toroidial transformer is fitted. The pre-amplifier employs a mother board with an array of plug-in circuit cards. The mm and mc sections are separate, and following an input buffer, passive high frequency and active low frequency RIAA equalisation is used. Top quality components are used throughout. The power amplifier uses electronic protection, this set so as not to prejudice the peak delivery into complex loads.

Sound quality

Though the price is high the *32/250* quickly demonstrated the standard of sound quality appropriate to its high reputation.

Although a trifle 'doctored' or 'bandlimited' in character, with a mildly 'forward' stereo presentation, the amplifier sounded superbly confident and controlled. It proved to be both detailed and articulate throughout the frequency range and held a good standard of image focus and reasonably good depth. Relaxed and musical, the performance was both involving and revealing.

Via moving-coil the results were fine, improving a little further on clarity and focus via moving-magnet. Via auxiliary, a good impression of the scale and attack present on the PCM programme was also given. It clipped well and could provide 103dBA into the normal speaker load, with a decent 101dBA into more difficult loads. Good subjective volume levels were possible, with more 'power' than the specification suggests.

Lab results

Rated at 70W (18dBW) the *32/250* showed a

superb power bandwidth into 8ohms, delivering 19dBW. The loss into 4ohms was very small, though the amp disliked the 2ohm pulses at 20kHz. A sufficient ±16A peak current rating was noted, with the fall in level from 8 to 2ohms held to just 2.5dB, which was a fine result. This is clearly a load tolerant model. Distortion levels were low, except at high frequencies where the results were poorer than average, and were considered just satisfactory. Signal-to-noise ratios were fine and output terminal dc offsets also commendably low. Input overload margins were fine, and stereo separation better than average, though it could be better still via aux. Channel balance and tracking were very good, with the pre-amp input characteristics fine. The power amplifier was not considered a difficult input to drive, and with short or even low-capacitance interconnects, it is possible to use even a passive control unit. The pre-amp will happily drive other models of power amp. The disc equalisation showed a broad, tailored response, very uniform through the middle octaves, and 1dB down at 20Hz and 10kHz.

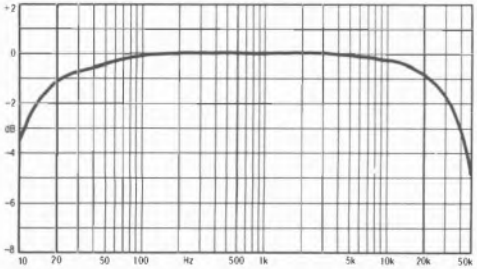
Conclusion

This costly amplifier system comes with an excellent reputation and an evidently high build quality. It was well finished and produced reasonably high sound levels, with a fine tolerance of the more awkward speaker loads. The sound quality was rated at the 'very good' level, consistently maintained via the various inputs and over the whole dynamic range. The two units are well matched to each other, and set a standard that justifies recommendation despite the substantial price.

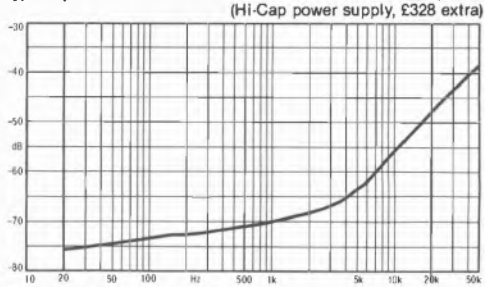
Test measurements

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.

GENERAL DATA	Pre-and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	70W(=18dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	19.0dBW	19.0dBW	19.0dBW
Both channels, 4ohm load	18.3dBW	18.3dBW	18.3dBW
One channel, 2ohms, pulsed	16.3dBW	16.5dBW	16.9dBW
Instantaneous peak current		+16A	−16A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−80dB	−80dB	−63dB
Intermodulation, 19/20kHz, rated power, aux input			−69dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−65dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−63dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−79dB
Disc (mc) input (IHF, CCIR weighted)			−72dB
Aux/CD input (IHF, CCIR weighted)			−80dB
Residual, unweighted (volume control at min)			−75dB
DC output offset			11mV
DC offset, pre-amp			1mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30dB	32dB	32dB
Disc (mc) input (IHF)	25dB	25dB	25dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	−74dB	−70dB	−47dB
Aux input	−75dB	−70dB	−48dB
Output impedance (damping)	0.18ohm	0.18ohm	0.18ohm
Channel balance, disc, at 1kHz			0.3dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.5dB	0dB	0.2dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.20mV	46kohms, 100pF
Disc (mc) input	Phono	0.01mV	1kohm
Aux input	DIN	10.3mV	20kohms, 220pF
Power amp	XLR	105.4mV	18kohms, 190pF
Output, pre-amp (tape)			7.7V max, 4.9ohms
Disc equalisation error, 30Hz-15kHz			+0dB, −0.7dB
Size (width, height, depth)			32 x 20.5 x 8.5cm, 32 x 43.5 x 8.5cm
Typical price inc VAT			£368, £822
			(Hi-Cap power supply, £328 extra)



Disc input: RIAA equalisation accuracy



Disc input: stereo separation

Onkyo Integra A-8057

Goodmans, 2 Marples Way, Kingscroft Centre, Havant, Hants PO9 1JF
Tel (0705) 486344

Onkyo is a Japanese brand of long and honourable pedigree, and many years ago was chiefly known here and in the USA for its high quality amplifier designs. After a gap of some years in which Onkyo had little or no UK distribution, the line was successfully re-introduced by Goodmans Loudspeakers. In the last few seasons the Onkyo name has become familiar, particularly on cassette decks and complete midi systems and 'conventional-size' rack systems; designed as part of one of these systems, the *A22* budget amplifier model scored a Best Buy in *Hi-Fi Choice: Amplifiers* a couple of issues back. For this edition, we have chosen a rather more upmarket design as the Onkyo representative.

Drawn from an extensive current product range, the Onkyo *8057* belongs to the upper price group of higher performance integrated amplifiers and incorporates an unusual power supply feature claimed to improve performance. A small extra transformer is incorporated, this the 'in phase' component which balances the positive and negative supply current pulses which feed the rectifiers. This improves regulation, ripple, and also main power transformer efficiency. The main reservoir capacitors are larger than usual at 15,000μF, and in any case, this is quite a substantial design, rated at 100W (20dBW) per channel.

Comprehensively equipped, the input facilities include moving-magnet and moving-coil cartridge, two tape units plus tuner, CD and auxiliary. Filters include loudness and a 15Hz subsonic cut, plus adjusters for bass and treble.

The interior revealed a complex construction involving eight printed circuit boards. An integrated circuit is used for the disc input with gain matching for both moving-magnet and moving-coil cartridges. At the output, the popular direct-coupled complementary bi-polar configuration is employed. The general build quality is to a high standard, as is the finish, which is in the usual satin black.

Sound quality

Scoring above average on listening tests, this amplifier's value-rated feature was its sound level, in that it could play pretty loud in view of its price. It reached 105dBA into the normal test speaker, with little diminution of level into a 4ohm load.

Sound quality proved consistent via both disc and CD inputs. The weakest area was the in treble, where some sibilance and 'edge' were observed. Fairly neutral in character, its ratings on coloration, stereo focus, detail and depth were all above average. It was however let down by a lack of 'sparkle' and transient attack — the overall effect was dulled and lacking in life or dynamic interest. Having said this, the *8057* did get on with

the job, producing a pleasant, straightforward sound, but it did not arouse much excitement amongst the panellists.

Lab results

With a peak output approaching 160W (21.8dBW) this amplifier provided a healthy level. Its peak current capability was somewhat unbalanced between the negative and positive directions, at +23 and −27.5A, but these figures were fine considering the nominal power ratings. The efficacy of the 'in phase' power supply was in part confirmed by the superb result on the 40Hz, 4ohm power test (see graph) where supply harmonics were non-existent even at −95dB! Distortion levels were negligible, noise levels fine, and DC offset was close to zero. Ample input overload margins were measured and while channel balance was generally good, the channel separation figures were uninspiring. The input characteristics were fine with sensible sensitivities and loadings. On the RIAA disc equalisation, the moving-magnet result (dotted trace) was over-extended in the bass, while the moving-coil input showed a sensible rolloff below 30Hz. Slight treble cut was observed on both curves.

Conclusion

This model sailed through the lab tests and was clearly quite a healthy performer in terms of output. It came well equipped and could accept virtually any signal source. On sound quality grounds it rated above average which was no disgrace, but at this price level was nonetheless insufficient for a recommendation. However, in view of its good power delivery, I feel that the *8057* is worth considering.

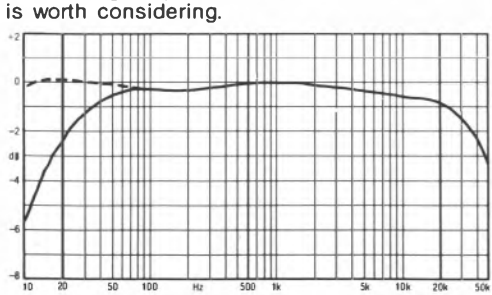
Test measurements

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.

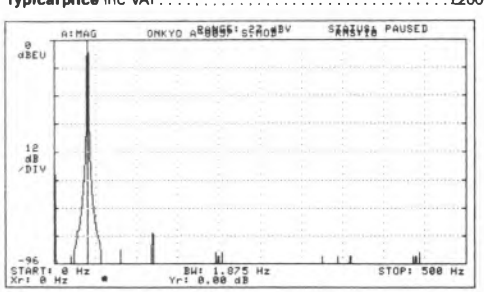
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			100W(=20dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.2dBW	20.2dBW	20.1dBW
Both channels, 4ohm load	17.8dBW	17.8dBW	17.7dBW
One channel, 2ohms, pulsed	—dBW	20.7dBW	—dBW
Instantaneous peak current		+23.0A	−27.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−88.5dB	−91.9dB	−84.2dB
Intermodulation, 19/20kHz, rated power, aux input			−79.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−77.1B
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−74.0dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−70.4dB
Disc (mc) input (IHF, CCIR weighted)			−67.6dB
Aux/CD input (IHF, CCIR weighted)			−71.7dB
Residual, unweighted (volume control at min)			−83.7dB
DC output offset			left 2mV, right 0mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	34.3dB	33.7dB	32.5dB
Disc (mc) input (IHF)	32.3dB	29.8dB	29.5dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	62.5dB	55.9dB	30.5dB
Aux input	84.0dB	55.8dB	30.5dB
Output impedance (damping)	0.12ohm	0.12ohm	0.15ohm
Channel balance, disc, at 1kHz			0.97dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.03dB	0.80dB	2.77dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.30mV	44kohms, 420pF
Disc (mc) input	Phono	0.02mV	100ohms, 7.8nF
Aux input	Phono	19.0mV	52kohms, 550pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) . . . . . 14.6V max, —ohms
Disc equalisation error, 30Hz-15kHz . . . . . +0dB, −0.06dB
Size (width, height, depth) . . . . . 44 x 14 x 39cm
Typical price inc VAT £200



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Opus 1/4

Sondex Ltd, The Old Cottage, Hough Lane, Alderley Edge, Cheshire SK9 7JD
Tel (0625) 582704

For this edition, we have tested the first of the new Opus products from the Sondex stable, the *Model 1* and *Model 4*, a pre-amp and power amp respectively, selling for around £500 each. Both units are finished in anodised black and are built in substantial alloy cases with robust front panels (the Orpheus badges in the picture will not now be used), by Capricorn Electronics of Charminster, Bournemouth.

Internally, the Opus *4* is constructed as a double-mono unit, and is rated at 100W per channel. However, a 250W version as well as separately-cased 100W mono units are planned. Like the pre-amp section of the *Amadeus*, the Opus 1 pre-amplifier has facilities for a range of plug-in matching modules allowing the user to correctly optimise moving-coil and moving-magnet cartridge loading.

As with the *Amadeus*, serious problems were experienced with the power amplifier. It survived the auditioning, but proved fragile on test, where it expired at the frequency extremes, and on lower test loadings. I feel more development work is required here.

Both units are described as Class A, and although this is true of the pre-amplifier (most are!), in the case of the power amp, this design does not run at a high standing current — heat-sinks ten times the size would be required for real Class A operation.

Sound quality

While good maximum sound levels of 105dBA were achieved into the 8ohm speaker load, we did not risk a maximum level test on the 4ohm load. Mechanical hum was audible from the power amp transformer.

No problems were encountered during the auditioning, where it became apparent that the *Opus* series had the makings of a fine product. Rated 'very good' on overall scores, both units were ranked similarly well, separately or in combination, and the results were similar as well via either moving-coil cartridge or disc, or via the Compact Disc/auxiliary input. The amplifier sounded clean at high levels, and provided strong stereo images of fine depth and ambience, very good focus and well defined stage width. The bass was firm and articulate, slightly on the dry side — a little more extension here would be welcome. Rated 'good', the treble range was not quite up to the standard of the rest seeming a touch forward and exposed, with a trace of 'fizz', this associated more with the power than with the pre-amplifier.

Lab results

The 100W (20dBW) rating was confirmed on test but little else is recorded in this section of the results table because of the premature failure of the output stage. Replacements went the same

way. Peak levels of 22dBW were estimated, at 8ohms. In fact, it was not possible to measure the 20kHz rated power distortion, since it expired on this test as well. At lower frequencies, the distortion was typically 0.3%, which is unexceptional.

Via auxiliary, the intermodulation was fine, but via disc the results were poor, owing to the inadequate disc overload margins at high frequencies. Given the sensitivity ratings, and taking account of the variable input options, these figures were not really sufficient for typical conditions. Satisfactory stereo separation results were measured, while the power amplifier showed a very low DC offset with negligible output impedances. Channel balances were accurately maintained.

On the 40Hz power test the distortion spectrum (seen in the graph) was unfavourable, with a surprising range of high order harmonics, and noted supply intermodulation. The disc equalisation was also found a little odd. The midrange was very accurate but the bass rolled off early, particularly via moving-coil, where it was −3dB by 50Hz, and 10dB down at 20Hz — an excessive rolloff in my view.

Conclusion

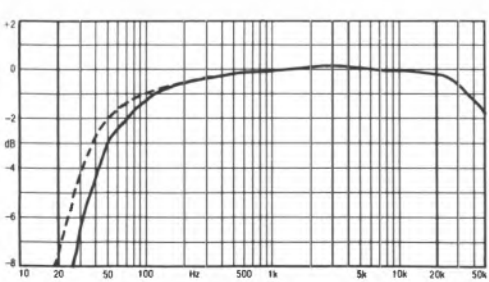
With the Opus range Sondex have demonstrated that a high standard of sound quality can be achieved, but have not yet adequately researched the durability of the power amplifier output stage, nor have they given sufficient consideration to the disc overload margins. A product potentially capable of recommendation, but unfortunately, this must be reserved until better samples are available.

Test measurements

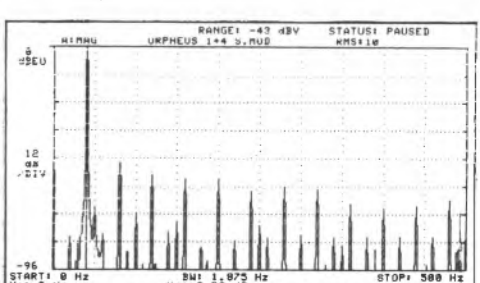
To show how well the amplifier sustains its 8ohm output into real loudspeaker loads, the level into 4ohms and 2ohms is given in dBW (where 0dB = 1W), without adding 3dB or 6dB respectively, as in usual 'power' ratings.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	100W(=20dBW)		
Power out put	20Hz	1kHz	20kHz
One channel, 8ohm load	—dBW	−21.dBW	—dBW
Both channels, 4ohm load	—dBW	—dBW	—dBW
One channel, 2ohms, pulsed	—dBW	—dBW	—dBW
Instantaneous peak current	see text		
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−52.0dB	−49.0dB	*dB
Intermodulation, 19/20kHz, rated power, aux input	−79.1dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	−13.6dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	−36.6dB		
Noise			
Disc (mm) input (IHF, CCIR weighted)	−62.0dB		
Disc (mc) input (IHF, CCIR weighted)	−63.8dB		
Aux/CD input (IHF, CCIR weighted)	−67.2dB		
Residual, unweighted (volume control at min)	−64.4dB		
DC out put offset	left 1mV, right 1mV		
DC offset, pre-amp	left 1mV, right 1mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	22.8dB	12.1dB	−4.4dB
Disc (mc) input (IHF)	17.9dB	3.8dB	−13.0dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	58.7dB	60.2dB	42.2dB
Aux input	94.4dB	70.0dB	44.2dB
Output impedance (damping)	0.12ohm	0.12ohm	0.28ohm
Channel balance, disc, at 1kHz	0.17dB		
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.28dB	0.27dB	0.28dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.30mV	var kohms, var pF
Disc (mc) input	Phono	0.01mV	var ohms, var nF
Aux input	Phono	30.5mV	var kohms, var pF
Power amp	Phono	78.0mV	—kohms, —pF
Output, pre-amp (tape)	4.83V max, —ohms		
Disc equalisation error, 30Hz-15kHz	+0.16dB, −6.00dB		
Size (width, height, depth)	33.5 x 7 x 28cm, 33.5 x 7 x 28cm		
Typical price inc VAT	£500, £500		

Note: — for power results see text



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Perreaux SA3/1850

DW Labs Ltd, P.O. Box 43, Dunstable, Beds LU6 2NZ
Tel (0582) 872138

Although the exotic Perreaux amplifiers have been available in this country for some time now, this is their first appearance in *Hi-Fi Choice*; samples of the earlier and more expensive pre/power combination were not received from the UK distributor in time for inclusion in the 1984-5 test programme. However, for this edition we received samples of a new pair of separates, comprising the *SA3* pre-amplifier and 1850 power amplifier. These units together form a combination which has been aimed at a more competitive price target than the previous models, which were rather costly, at least by UK standards.

Built in New Zealand, these products were initially and successfully intended for the US market and as such it is not surprising that they have a North American flavour. Appearance is both immaculate and distinctive while the build quality is also very high. Aimed at the price-conscious end of the audiophile sector, the combination sells for around £1600 and may also be purchased as separates. The *1850* comprises a substantial power amplifier rated at 180W (22dBW) per channel. A massive central toroidal transformer supplies separated reservoir sections for each channel, the amplifier output using a direct coupled set of paralleled complementary MosFet devices.

The matching *SA3* preamp conforms to the 'straight line' viewpoint, lacking as it does either filters or tone controls. Conversely it does have a good range of input facilities including moving-coil and moving-magnet cartridges, Compact Disc auxiliary, tuner and tape. Loading plugs can be added to adjust the cartridge switching.

Inside, the *SA3* uses fine components with all-discrete circuitry, working on high voltage rails, thus ensuring great overload margins. Let us hope that it sounds as good as it looks!

Sound quality

Scoring a straight 'good' in the auditioning, this result was not disastrous but was undeniably a disappointment in view of its price. The amplifier was certainly very powerful, comfortably attaining a 109dBA sound level with the test loudspeakers.

Auditioned separately as well as in combination, the two units were found to rate similarly and were judged to be well matched, with the pre-amp showing a slight edge over the power amp on clarity.

With only a trace of treble fizz and associated veiling the mid was described as rich and 'creamy' with good detail and instrumental separation. Some loss of air was noted and musical dynamics lacked full authority and range. Stereo focusing was good, with fair perspectives. Bass was powerful but was not fully articulate or tuneful. Some mild lower mid prominence lent an uneven effect in terms of frequency balance, however.

Lab results

On peak power, the amplifier was heading towards 400W per channel with only a small loss at 4ohms. On continuous drive, it was nearer 300W per channel, and at ±30A the associated peak current reserve was more than satisfactory.

Although the power amplifier's DC offsets were a little high, the output impedance was very low at a constant 0.03ohms. The generally good design can be seen in the fine result on 40Hz power modulation, shown in the graph — here the 100Hz power supply component was suppressed by over 90dB.

Noise levels were very good for the pre-amp, while input overloads were fine, diminished at 20kHz but still sufficient in practice. Very good channel separations were obtained, while all the input/output characteristics were favourable. The RIAA equalisation was very good at low frequencies but showed a mild rolloff in the treble amounting to −1dB by 20kHz — of little consequence. Channel balances and matchings were fine.

Conclusion

This powerful amplifier offers a combination of excellent finish and build quality allied to highly competent design. Versatile and flexible, they should provide an enduring performance to a good sonic standard; however, such is the competition in the amplifier field, that these new amplifiers, while better than previous Perreaux models, have not yet attained a high enough ranking for recommendation.

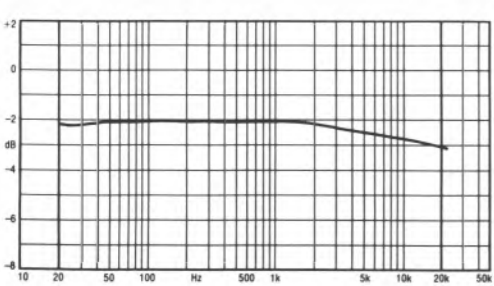
Test measurements

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.

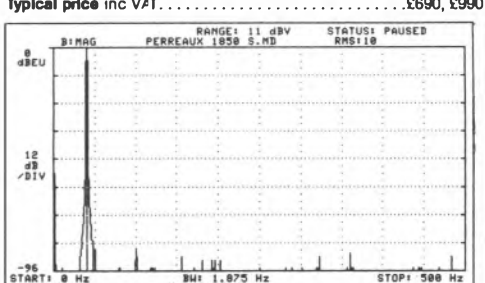
GENERAL DATA	Pre-and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	180W(=22dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	24.7dBW	24.7dBW	24.5dBW
Both channels, 4ohm load	22.7dBW	22.8dBW	22.8dBW
One channel, 2ohms, pulsed	—dBW	22.5dBW	—dBW
Instantaneous peak current		+32.5A	−30.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−86.0dB	−83.7dB	−70.3dB
Intermodulation, 19/20kHz, rated power, aux input			−71.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−61.5dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−46.9dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−82.0dB
Disc (mc) input (IHF, CCIR weighted)			−82.0dB
Aux/CD input (IHF, CCIR weighted)			−71.5dB
Residual, unweighted (volume control at min)			−77.6dB
DC output offset			left 50mV, right 70mV
DC offset, pre-amp			left −1mV, right −1mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	37.5dB	32.5dB	11.6dB
Disc (mc) input (IHF)	32.0dB	33.0dB	14.5dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	85.5dB	85.6dB	82.0dB
Aux input	66.0dB	66.0dB	62.5dB
Output Impedance (damping)	0.03ohm	0.03ohm	0.02ohm
Channel balance, disc, at 1kHz			0.1dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.07dB	0.07dB	0.60dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.16mV	40.0kohms, 130pF
Disc (mc) input	Phono	0.02mV	40.0ohms, n/a nF
Aux input	Phono	25mV	20.0kohms, 25pF
Power amp	Phono	110mV	50kohms, 250pF

Output, pre-amp (tape) 3.3V max, 490ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.9dB
Size (width, height, depth) 48 x 4 x 34cm, 48 x 13, 42cm
Typical price inc VAT £690, £990



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Pioneer A-77X

Pioneer High Fidelity (GB) Ltd, Field Way, Greenford, Middlesex UB6 8UZ
Tel 01-575 5757

Pioneer have long maintained a top-end range of heavily-constructed, comprehensively equipped amplifier models in addition to their lower priced volume-selling lines, and in common with other Japanese manufacturers have from time to time announced technical innovations claiming to offer significant benefits in amplifier performance. In the last two *Amplifiers* editions we covered the impressive upmarket *A-80* model, which despite an excellent technical performance was considered to be only average in sound quality terms; and the simple, budget *A-301* (now also discontinued) which proved a surprisingly capable performer in sound quality terms, taking into account its very low price. However, for this edition, we have tested a new upmarket Pioneer model, the *A-77X*.

Priced close on £400 this large integrated amplifier has a continuous, per channel rating of 100W (20dBW). Its designers have lavished much care and expense, this satin black unit coming comprehensively equipped. Two sets of speakers may be connected via large binding posts and a good load tolerance enables both to be used simultaneously, if required. On the input side the following may be connected via the phono sockets: two tape decks, moving-coil and moving-magnet disc, CD, auxiliary, tuner and aux/video. Three shrouded mains outlets are provided. Inside, the usual Japanese style of multiple board construction is evident, with tidy ribbon wiring harnesses. No less than three mains transformers are present, and in essence, the output stages are arranged as a double mono set with four 8,200μF reservoir capacitors.

The output is direct-coupled, with a paralleled set of bi-polar, complementary output transistors. Good components are used and the build quality is also high.

Sound quality

In the listening tests, the *A77X* was considered to be rather below average, in the context of this issue, and the review ranking was 'poor'. On Compact Disc, the mid register was described as 'thin' with a pinched, compressive effect and a glassy, grating treble. Stereo focus was average, but stereo depth was rather lacking. There was a consistent lack of dynamic impact or drama about its reproduction and while the bass was powerful it was also rounded and lacking in articulate 'slam'.

On analogue disc, via the moving-coil input the sound worsened compared with that which had been heard via the CD/aux input. The loss of detail was considerable while image width seemed constricted and tending to a flat mono effect. High frequencies also suffered from a 'leaden' quality, while the bass was regarded as uninformative.

Lab results

Try as we did, there appeared to be no easy association between the noted sound quality and the lab results. With a peak 8ohm output approaching 200W per channel, the output was typically better than 20dBW (100W) under most conditions of loading. A quite healthy ±25A peak current was allowed, which gave sound levels of up to 105.5dBA on real speaker loading. Harmonic and intermodulation distortions were very good — perhaps too good in view of the association between moderate distortion, low, feedback design and preferred sound quality. The input noise figures came out well, while DC offsets were zero to all intents and purposes. Input overload was ample, while good channel separations were noted. Channel balance was closely maintained throughout the volume range while the input characteristics were arranged in good order. An exemplary result was obtained for RIAA equalisation while the spectrum analysis of the 40Hz, 4ohm, power test measurement showed undetectable harmonic or mains supply distortion.

Conclusion

Here we have that recurring contradiction — an amplifier which according to established precepts and even our own test schedule, performs to a really high standard, and yet failed to deliver an acceptable subjective result when auditioned. For the money, this Pioneer simply did not offer a sufficient standard of sound quality for any recommendation; without good sound, in our view, a good technical performance unfortunately cannot count for much.

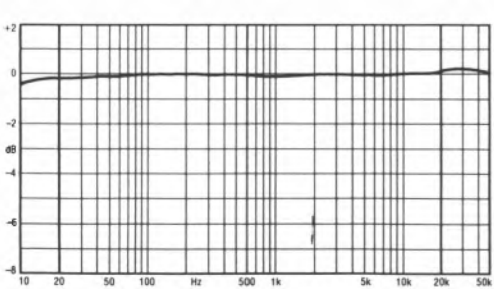
Test measurements

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.

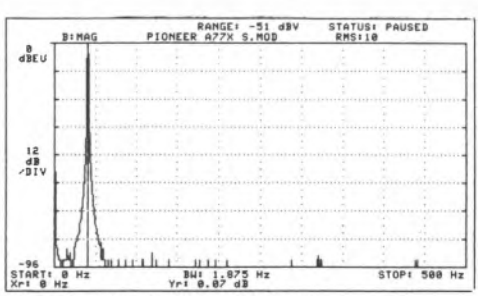
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			100W(=20dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.5dBW	21.0dBW	20.9dBW
Both channels, 4ohm load	19.0dBW	19.6dBW	19.5dBW
One channel, 2ohms, pulsed	–dBW	–20.0dBW	–dBW
Instantaneous peak current		+26.0A	–25.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	–85dB	–88dB	–84dB
Intermodulation, 19/20kHz, rated power, aux input			–108dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			–97dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			–81dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			–75dB
Disc (mc) input (IHF, CCIR weighted)			–68dB
Aux/CD input (IHF, CCIR weighted)			–74dB
Residual, unweighted (volume control at min)			–90dB
DC output offset			left –2mV, right –2mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	33.9dB	33.5dB	31.5dB
Disc (mc) input (IHF)	32.4dB	31.0dB	30.5dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	100.2dB	94.6dB	73.4dB
Aux input	57.2dB	57.3dB	61.6dB
Output impedance (damping)	0.06ohm	0.06ohm	0.09ohm
Channel balance, disc, at 1kHz			0.48dB
Volume/balance tracking	0dB	–20dB	–60dB
Aux input	0.09dB	0.11dB	0.22dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.25mV	47kohms, 260pF
Disc (mc) input	Phono	0.02mV	100ohms, 11nF
Aux input	Phono	15mV	40kohms, —pF

Output, pre-amp (tape) 3.7V max, 41ohms
Disc equalisation error, 30Hz-15kHz +0.1dB, –0.1dB
Size (width, height, depth) 46 x 15.5 x 43cm
Typical price inc VAT £370
**inc noise*



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Proton D540

Hi-Fi Markets Ltd, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737

Still a relatively new name on the UK hi-fi scene, Proton is an American brand whose products are mainly sourced in the Far East. Although the products have much in common with those of NAD, they are distributed largely through different outlets at retail level.

In the last edition, we published a full review of the moderately priced Proton *520* amplifier (now covered in the *Summary Reviews* section); in the new test programme for this issue we were able to include the larger *540*, a much more powerful and sophisticated integrated amplifier which proved to be a rather different proposition altogether.

A compact, low profile integrated amplifier, the *540* offers a nominal 40W per channel and at first sight, looks rather pricey at £240. However there is more here than meets the eye, and like the NAD *2200* power amplifier (they are related), it has a dramatic peak power capability. In this instance it measured 300W peak (24.5dBW), which only fell away 1dB into a cruel 2ohm loading. In real terms the latter figure represents 850W peak per channel from this unassuming design!

The *540* looks simple enough, but on opening a small door in the front panel, a set of auxiliary controls are revealed — bass, treble, balance, loudness, mono/stereo and bass equalisation, this last gives 10dB boost at 40Hz, intended for small sealed box speakers. Two sets of speakers may be connected while separate selectors are used for signal and tape record outputs.

The inputs include moving-magnet (with several capacitance options) moving-coil (with loading options), tuner, video, Compact Disc and two tape decks.

Inside, the unit is tightly packed, with dual mains transformers and 10,000μF reservoirs on the high voltage supply. The signal routing is very complex and extended, with many plugs and sockets, extender boards and harnesses. In addition, a bridge mode is incorporated, with pre/power connectors, to allow use of an external additional power amplifier. Robust output devices are fitted.

Sound quality

Achieving a quite respectable 'good' in the auditioning, the quality was rated as consistent via the various inputs, with CD having only a slight lead. It could play loud — up to 107dBA on the test loading — and proved to be solid and competent. Bass was firm, the treble slightly grainy and there was a trace of roughness in the mid.

Stereo focus was quite good, and worthwhile levels of depth and ambience were portrayed. Moreover the *540* reproduced a good measure of the dynamics and drive of the programme we tried.

RECOMMENDED

Lab results

The peak ratings have already been noted but the continuous ratings were also worth commenting on — for example, continuous output was virtually double the spec at 80W and peak current delivery was substantial at +33A! The 40Hz power spectrum was also very creditable.

Both harmonic and intermodulation distortion levels were negligible and good input overload margins were also demonstrated. Input noise levels were fine throughout, while DC offsets were held to a very small value.

Channel separations were good, and the amplifier also offered a negligible output impedance. On channel balance, a close tolerance was held at all levels and inputs. Input characteristics proved to be all in order, including the versatile input loading options. On RIAA equalisation, some mild treble loss was observed via moving-coil input, but in general, the accuracy was good.

Conclusion

This compact amplifier established a unique niche for itself in this issue. Offering a decently competant sound, it was highly versatile in terms of sources, and also offered many other facilities. A particular feature was the relatively high peak programme power output, exceeding 200W, which was held into some of the worst speaker loads. Taken overall, the *540* offered good value and attained a solid recommendation.

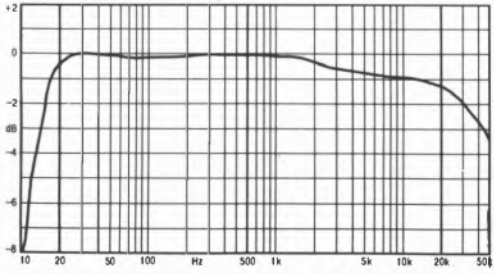
Test measurements

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.

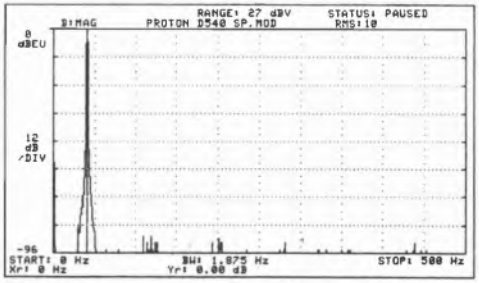
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			40W(=16dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.3dBW	18.4dBW	18.1dBW
Both channels, 4ohm load	15.9dBW	16.5dBW	16.0dBW
One channel, 2ohms, pulsed	—dBW	23.5dBW	—dBW
Instantaneous peak current		+32.5A	−33.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−85.0dB	−88.5dB	−74.3dB
Intermodulation, 19/20kHz, rated power, aux input			−85.8dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−84.3dB
Intermo dulation, 19/20kHz, at 0dBW, disc (mc)			−50.7dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−76.6dB
Disc (mc) input (IHF, CCIR weighted)			−69.2dB
Aux/CD input (IHF, CCIR weighted)			−80.4dB
Resi dual, unweighted (volume cont rol at min)			−94.4dB
DC output offset			left 4mV, right 6mV
DC offset, pre-amp			left 0mV, right 0mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	35.3dB	34.5dB	33.5dB
Disc (mc) input (IHF)	26.9dB	25.9dB	25.7dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	48.2dB	58.3dB	38.6dB
Aux input	68.0dB	62.6dB	40.7dB
Output impedance (damping)	0.08ohm	0.06ohm	0.26ohm
Channel balance, disc, at 1kHz			0.02dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.02dB	0.26dB	0.19dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.40mV	47kohms, 200pF
Disc (mc) input	Phono	0.016mV	96ohms, 0.7nF*
Aux input	Phono	24.2mV	34kohms, 140pF
Power amp	Phono	161mV	16kohms, 35pF

Output, pre-amp (tape) 14.8V max, —ohms
Disc equalisation error, 30Hz-15kHz +0.05dB, −0.95dB
Size (width, height, depth) 42 x 8 x 32cm
Typical price inc VAT £239
** on 'low' setting*



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

QED A230S

QED Audio Products Ltd, Unit 12, Ashford Industrial Estate, Shield Road, Ashford, Middlesex TW15 1AU
Tel Ashford 46236

This recently introduced amplifier designed and built in Britain had the distinction of just breaking the £100 barrier. It now retails for around £109, a price which had previously been considered uncommercial so far as UK manufacture is concerned. In fact the *A230* forms part of a complete QED system, including turntable, tuner and a cassette deck.

The amplifier is cased in a serviceable Nextel finished cover although for an extra £20 this can be replaced by a real veneer sleeve of fine quality. Front panel facilities include selector buttons for disc (moving magnet) tuner and tape. Disc socketry is in phono, the rest in DIN. No tone controls are present, but a headphone outlet is, linked to one set of 4mm speaker connections on the rear panel. Another set of sockets is provided to bypass the headphones offering a more direct path and a claimed higher quality.

Interior construction was to a surprisingly good standard. Not only are a number of high quality parts used, but the mains wiring is properly switched as well as shrouded. A top quality toroidal mains transformer feeds a pair of selected 4700μF capacitors.

The disc stage employs an input buffer followed by a passive filter for the high frequency part of the RIAA equalisation. An active stage follows, with the low frequency section plus subsonic filtering, using selected TLO 72 Fet op amps.

Employing Darlington complementary triples, the output stage is direct coupled to the load and series fuses are avoided. The differential input is filtered to prevent slew limiting or associated latching in the later amplifier stages.

Sound quality

Auditioned via the auxiliary input, with selected CD sources, this little amplifier gave a lively, coherent performance. Clarity was fine, especially in the mid band, and some depth and ambience were present here scoring above average. The band extremes were a little untidy — there was some softness in the bass and a touch of 'zing' in the treble.

An equally promising standard was achieved via the disc input. Clean and articulate, mid detail was most presentable, and while the treble hinted at brightness this was not excessive. A touch of hardness did however creep in at higher listening levels. Maximum

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sound levels of 100dBA (8 ohms) and 98.5dB (4 ohms) were obtained on the listening tests.

Lab results

Rated at 30W (14.5dBW) the *A230* offered a healthy output on test, approaching 16.5dBW 8 ohms. A good 8 ohm power bandwidth was shown at 16dBW, with the loss in level at 4 ohms being typically slight at 1.6dB, though it had reached 4dB by 2 ohms. Peak current was generous for the size, reaching ±12.5A and indicating a fine load tolerance. The 40Hz power spectrogram was less encouraging however, and showed a high content of spurious signals associated with the line frequency.

Distortion levels were satisfactory as were the input noise figures. DC offset should not cause any problems, while input overload margins were fine. Channel separation was better than average but channel balance was less satisfactory, and at low volume settings, level tracking seriously deteriorated. Input sensitivities and loadings were fine.

Our sample proved to be extraordinarily accurate on RIAA equalisation with nicely tailored rolloffs at the band extremes. From 70Hz to 15kHz it met amazing ±0.06dB limits for both channels.

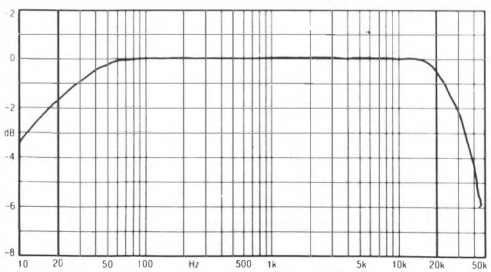
Conclusion

With a moderate price increase, the performance and finish have both been improved. Once again, this tolerant amplifier did well in the tests and confidently retains its Best Buy rating.

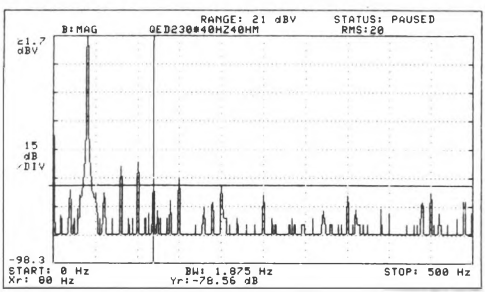
Test measurements

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.

GENERAL DATA	Integrated amplifier		
Power output			
Rated power into 8ohms, maker's spec	30W(= 14.5dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.0dBW	16.3dBW	16.0dBW
Both channels, 4ohm load	14dBW	14.8dBW	14.6dBW
One channel, 2ohms, pulsed	—dBW	12.5dBW	—dBW
Instantaneous peak current		+ 12.56A	– 12.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	– 85dB	– 71dB	– 62dB
Intermodulation, 19/20kHz, rated power, aux input			– 67dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			– 65dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			– —dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			– 67dB
Disc (mc) input (IHF, CCIR weighted)*			– —dB
Aux/CD input (IHF, CCIR weighted)			– 72dB
Residual, unweighted (volume control at min)			– 75dB
DC output offset			left 5mV, right 23mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	31dB	29dB	26dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	73dB	72dB	44dB
Aux input	65dB	66dB	54dB
Output impedance (damping)	0.55ohm	0.05ohm	0.06ohm
Channel balance, disc, at 1kHz			0.6dB
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.2dB	0.5dB	10dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.6mV	47kohms 70pF
Disc (mc) input	—	—mV	—ohms —pF
Aux input	DIN	40mV	52kohms 50pF
Power amp	—	—mV	—kohms —pF
Output, pre-amp			>5V max, —ohms
Disc equalisation error, 30Hz-15kHz			+ 0dB, – 1dB
Size (width, height, depth)			35.5 x 7 x 24.5cm
Typical price inc VAT			£109



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

QED A240-CD

QED Audio Products Ltd, Unit 12, Ashford Industrial Estate, Shield Road, Ashford, Middlesex TW15 1AU
Tel Ashford 46236

It is now some time since QED first enjoyed the UK market's warm acceptance of their original *A230* amplifier design. At that point, one of their main objectives was to offer an all-British design at under £100, and this they did, although subsequently the price has crept up slightly. The *A230* has also been the subject of some internal improvements, to become the *A230S*, which is covered in a separate review, but in the meantime, QED have also developed and introduced a new, more powerful model in the form of the *A240CD*.

As its name implies, this model has been designed with attention given specifically to performance on Compact Disc. Like the *'230*, it is available in two versions, one with a wood sleeve, and both finish and appearance have been much improved compared with the earliest *'230*. Our review sample was in black livery with gold legends.

Offering a marginally higher rated power output at 40W, the *A240* is only 1dB louder than the smaller model, and so in reality its other features are of greater significance than the power increase. The 'CD direct' facility allows the Compact Disc user to bypass the line amplifier for optimum sound quality; there is also the option (at extra cost) of fitting a higher-performance analogue disc input stage. No tone controls or filters are provided, and the balance control may be bypassed. All inputs are via the usual RCA phono sockets, while the speaker outlet connections are provided by high-current 4mm sockets.

Essentially, the design is based on a single board construction, and the interior view revealed good build quality with fine quality components. At the output the amplifiers use a bi-polar complementary arrangement, direct-coupled to the load; integrated circuits are used for the earlier stages, including the RIAA equalisation.

Sound quality

Rated a highly respectable 'good plus', the *A240* significantly improved upon the performance of the *A230S*. It also provided quite decent sound levels of 100dBA, which held up well into the 4ohm load. I wonder whether the 'super' disc option is worth worrying about, since our tests gave a similarly good rating for both the disc and CD inputs.

Via CD, it was considered well balanced, with notably good drive and dynamics. Focus was very presentable, while quite good levels of depth and ambience were portrayed. The bass had 'speed', coupled with good definition, while the treble was also well above average.

Via disc, the treble seemed slightly less tidy while the impression was of a mildly 'thinned' tonal balance in the mid range plus some added brightness. The solid bass, good definition and

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decent stereo remained, however.

Lab results

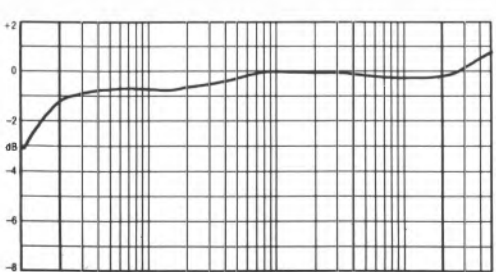
Conservatively rated, this amplifier raised 18dBW under peak programme conditions. The continuous output was near 17dBW, falling to 14.5dBW into 4ohms, and the output held up well into 2ohms, reflecting the good peak current rating of ±12.75A.

Distortion levels were fine, with really good results for intermodulation at high frequencies. Noise levels were fine while the DC offset at the power amplifier was respectably low. The modest input overload margins reflected the omission of a line amplifier but in practice they were considered sufficient. Really good for its class, the stereo separation results were commendable, with channel balance generally good but deteriorating at low signal levels — for example, an 8dB imbalance at a −60dB setting. The input characteristics were fine. The reason for the slight brightness on disc was obvious from inspection of the RIAA equalisation where mild shelf boost above 400Hz was apparent.

Quite a good result was obtained on the 40Hz power intermodulation test.

Conclusion

QED are learning fast. The *A240* is their best yet, and was well placed in a highly competitive market. We liked this lively performer, which offered very good value and was worth a Best Buy rating in this new edition.



Disc input: RIAA equalisation accuracy

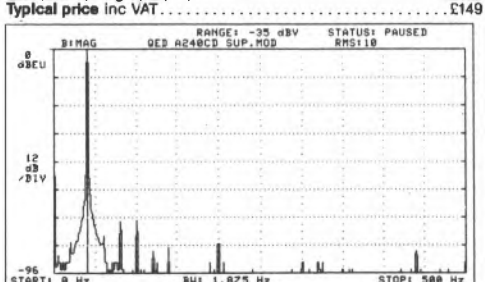
Test measurements

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			40W(=16dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	16.9dBW	17.3dBW	15.9dBW
Both channels, 4ohm load	13.4dBW	14.8dBW	14.5dBW
One channel, 2ohms, pulsed	—dBW	15.5dBW	—dBW
Instantaneous peak current		+13A	−12.5A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−71.6dB	−76.9dB	−63.1dB
Intermodulation, 19/20kHz, rated power, aux input			−79.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−74.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−72.0dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−69.5dB
Residual, unweighted (volume control at min)			−77.5dB
DC output offset			left 10mV, right 12 mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	19.1dB	17.5dB	15.2dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	89.0dB	88.5dB	66.6dB
Aux input	75.0dB	69.3dB	43.6dB
Output impedance (damping)	0.09ohm	0.09ohm	0.10ohm
Channel balance, disc, at 1kHz			0.73dB
Volume/balancetracking	0dB	−20dB	−60dB
Aux input	0.04dB	0.68dB	8.05dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.49mV	47kohms, 150pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	Phono	60mV	14kohms, 15pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 10.8 max, 8.9ohms
Disc equalisation error, 30Hz-15kHz +0.02dB, −0.85dB
Size (width, height, depth) 36 x 6 x 25cm
Typical price inc VAT £149



Power supply rejection, 40Hz input

Quad 34/405

Quad Electro Acoustics Ltd, 30 St Peters Road, Huntingdon, Cambs PE18 7DB
Tel (0480) 52561

Quad's *34* and *405* are a well-established pre- and power amplifier combination, selling for little over £500. A 100W per channel unit, the *405* 'Current Dumping' power amplifier is now in MkII form and seeks to serve more difficult loudspeaker loads than previously accommodated, this overcoming a known drawback for *405* purchasers in the past. The compact *34* pre-amp is attractively styled, and offers good versatility. Inputs here include disc (moving-magnet and moving-coil modules are user-interchangeable, with alternative loading as well as sensitivity options available), tuner, aux/CD and tape. If a three-head tape machine is to be used, the aux may alternatively double as a second tape facility.

Together with electronic signal switching using CMOS, the main pre-amp circuitry is based on TL071 IC amplifiers. The power amp uses a generous 'C core' mains transformer feeding 10000μF reservoir capacitors, with the output stage employing unbiased, quasi-complementary current dumpers, with a 5W Class A 'base amplifier'. Another TL071 is used at the input here. The new electronic protection provides for peak currents up to 8A depending on the previous programme power history.

Sound quality

Scoring rather above average over the spectrum of listening tests, the result was nonetheless not too promising in view of the high attainment achieved by some of the latest generation of amplifiers.

Via disc (moving-coil) the sound was pleasantly neutral, particularly in the mid register. Both bass and treble resolution were above average though it was not especially transparent. Stereo images were rendered with only average focus and depth, but via moving-magnet the sound did improve slightly as regards clarity.

Via the auxiliary input some additional improvement was noted, but this was insufficient to raise the subjective rating into the 'Good' category. The treble was still showing some mild 'feathery muzziness', while the bass could have offered more extension and impact, this especially noted on digital programme. The amplifier did show an improved capability into adverse loading, with a mild 1dB fall from the normal 105dBA maximum output, but it still sounded poor if even mildly clipped; and the maximum sound level was in practice little higher than for the smaller PS Audio model, for example.

Lab results

Rated at 100W (20dBW) the Quad *405* met specification over the 20Hz to 20kHz power bandwidth. Into 4ohms the bandwidth loss was more serious but this result may be due to the operation of protection circuits. Peak current measured ±8A which was not really enough for the output level. Peak output held well from 8 to 4ohms, but fell by a total of 7·8dB into 2ohms. Really severe loads are not recommended.

Distortion levels raised no queries, while the signal-to-noise ratios were fine. The dc output

offset was very low. Disc overload margins were also satisfactory; the reduced 10kHz figure still within the required margin. Stereo separation was above average and channel balance highly accurate over the whole operating range.

Input characteristics were typical and though the moving-magnet capacitance was rather high, this could be easily altered if required by the dealer. The power amp was easy to drive but as supplied the pre-amp has a rather limited output, of just over 0·6V. A resistor change inside (Quad-approved) will however allow an increase to several volts if required for use with other power amplifiers of 1-2v sensitivity. The RIAA equalisation was uniform in response, and sensibly tailored to rolloff the output beyond the audible range. The versatile tone control stages are shown, our graph too small to carry the additional variable 'tilt' tonal balance facility.

Conclusion

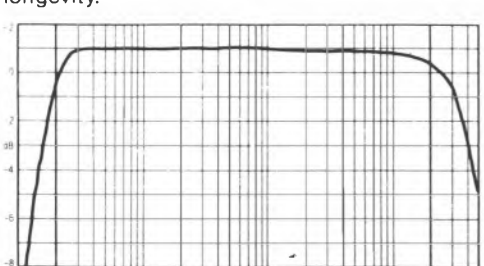
These two finely-constructed components partner each other well, and for basically 8ohm speaker loads, they can offer a pleasant and consistent sound, with considerable versatility. In particular the special tone controls provide for a wide range of adjustment to cope with some of the more difficult programme sources available, and would for example suit a collector with an extensive disc library.

The sonic attainment was however not in our view quite sufficient at the price for a full recommendation, but the system nonetheless remains worthy of consideration, taking into account aspects such as build quality and longevity.

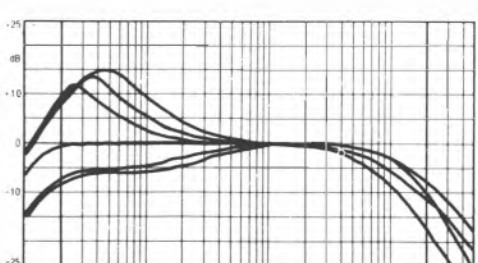
Test measurements

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.

GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	100W(= 20dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	20.4dBW	20.6dBW	20.3dBW
Both channels, 4ohm load	15.3dBW	19.1dBW	15.3dBW
One channel, 2ohms, pulsed	12.7dBW	13.2dBW	10.4dBW
Instantaneous peak current		+8 A	−8 A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−68dB	−79dB	−66dB
Intermodulation, 19/20kHz, rated power, aux input	> −80dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mm)	−70dB		
Intermodulation, 19/20kHz, at 0dBW, disc (mc)	−69dB		
Noise			
Disc (mm) input (IHF, CCIR weighted)	−80dB		
Disc (mc) input (IHF, CCIR weighted)	−74dB		
Aux/CD input (IHF, CCIR weighted)	−81dB		
Residual, unweighted (volume control at min)	−70dB		
DC output offset	3mV		
DC offset, pre-amp	1mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30dB	30dB	19dB
Disc (mc) input (IHF)	27dB	27dB	16dB
Aux/CD input (IHF)	20dB	20dB	20dB
Stereo separation			
Disc input	−68dB	−67dB	−49dB
Aux input	−68dB	−65dB	−51dB
Output impedance (damping)	0.04ohm	0.04ohm	0.08ohm
Channel balance, disc, at 1kHz	0.2dB		
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0dB	0dB	0.1dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Ft ono	0.30mV	48kohms, 277pF
Disc (mc) input	Phono	0.013mV	100ohms, 22nF
Aux input	DIN	11.3mV	kohms, pF
Power amp	DIN	53.0mV	37kohms, 300pF
Output, pre-amp (tape)	0.65V max, 800ohms		
Disc equalisation error, 30Hz-15kHz	+0dB, −0.35dB		
Size (width, height, depth)	32 x 21 x 6cm		
Typical price inc VAT	£249, £289		



Disc input: RIAA equalisation accuracy

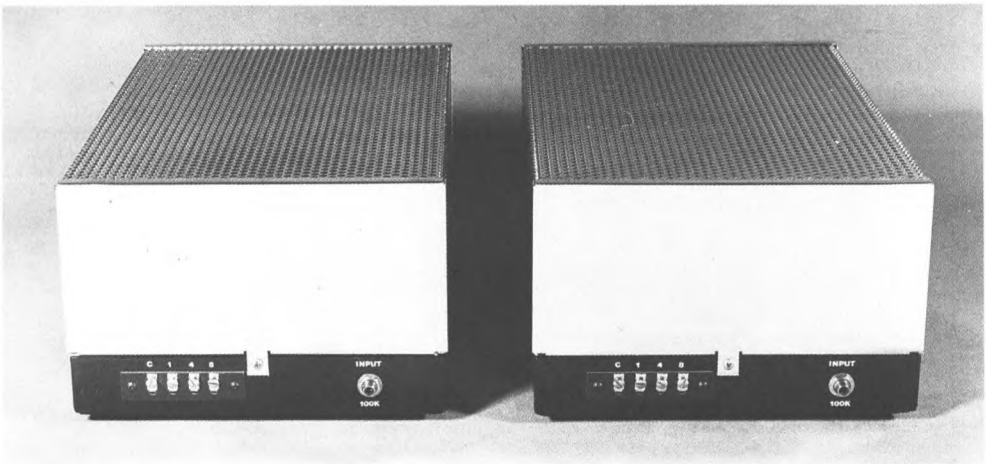


Tone control/filter responses

RECOMMENDED

Quicksilver power amplifier

Vital Systems, 38a The Meadow Way, Harrow Weald, Middlesex HA3 7BW
Tel 01-863 8988



Built in the USA in relatively small numbers, these mono-block valve amplifiers make an interesting addition to the UK market. Rated at 60W per channel they cost £1550 a pair, and promise good sounds if US reports are anything to go by.

Utterly traditional, these amplifiers even use valve rectifiers and no regulation. Fixed bias is employed with the 8417 output valves biased to 63mA each, a comfortable enriched Class 'A' rating. Large (for a valve amp that is) 320μF reservoir capacitors are used in a CLC smoothing circuit incorporating a choke, the latter section feeding the low level stages. The simple signal paths are coupled with quality polypropylene capacitors, the input is direct coupled, while the output is transformer coupled, push-pull ultra-linear. At the secondary (feedback coupled) tappings for 8, 4 and 1ohm operation, are provided, the last being for direct connection to ribbon drivers.

Speaker connection is via screwdriver posts, with input via a phono socket, 100kohm input impedance. The mains switch is single pole, unshrouded — I would like to see an improvement here!

Sound quality

Well, good amplifiers do exist after all, even if they appear to have been designed back in 1955! The Quicksilver scored 'excellent' on the listening tests and achieved this standard mainly by virtue of a top class transparency. With that quality properly established, the rest fell neatly into place. It proved to be powerful, producing quite substantial sound levels. Bass was highly rated for 'speed' and articulation, but with a hint of richness and overhang. Slightly mellow, the treble remained airy and open with clear, articulate detail. The mid was considered neutral while the stereo focus, width and depth were all extremely good. Finally, it was also dynamic, lively and full of interest as well as possessing a low 'fatigue factor'.

Lab results

On programme peaks it reached 102dBA, based on a peak level of 18.5dBW (around 75W). A good power bandwidth was shown at rated power, this indicative of a high-quality output transformer.

Another surprise was the remarkable load tolerance with a peak current of 13.5A; clearly this is a load-tolerant amplifier. On the 4ohm tap it would even handle 2ohm loads!

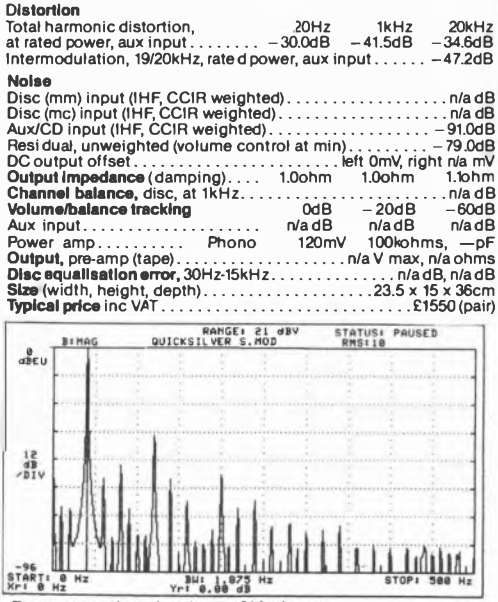
Low feedback is a feature of this design and resulted in rather high distortion of 1% mid band, and nearer 3% at the frequency extremes. Better intermodulation results were observed, while distortion improved greatly at lower powers. Noise levels were fine, though some transformer hum was present on our samples. The output

impedance was rather high at 1ohm; sufficient to change the sound of many speakers to some small degree. A certain amount of supply modulation can be seen in the 40Hz power spectrogram.

Conclusion

This amazing amplifier demonstrated just how poor the lab results can be while at the same time attaining a top class sonic standard. Its load tolerance was a surprising asset, and the sound quality was heading toward the £2,500 level. It offered its own unique strengths, of which transparency was its trump card; warmly recommended, but check the transformer hum and overall system compatibility carefully.

GENERAL DATA			Power amplifier (mono)
Power output			
Rated power into 8ohms, maker's spec			60W(=17.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.5dBW	17.6dBW	16.9dBW
One channel, 4ohm load	15.6dBW	15.3dBW	14.4dBW
One channel, 2ohms, pulsed	—dBW	15.0dBW	—dBW
Instantaneous peak current		+14.0A	−13.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−30.0dB	−41.5dB	−34.6dB
Intermodulation, 19/20kHz, rated power, aux input			−47.2dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			n/a dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−91.0dB
Resi dual, unweighted (volume control at min)			−79.0dB
DC output offset			left 0mV, right n/a mV
Output impedance (damping)	1.0ohm	1.0ohm	1.1ohm
Channel balance, disc, at 1kHz			n/a dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	n/a dB	n/a dB	n/a dB
Power amp	Phono	120mV	100kohms, —pF
Output, pre-amp (tape)			n/a V max, n/a ohms
Disc equalisation error, 30Hz-15kHz			n/a dB, n/a dB
Size (width, height, depth)			23.5 x 15 x 36cm
Typical price inc VAT			£1550 (pair)



Power supply rejection, 40Hz input

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Rotel RA-820BX

Rotel Hi-Fi, 25 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR
Tel (0908) 317707

Each successive review appears to reflect a further suffix to this model's number. Now further revised, the special *'BX* version of the *RA-820* is a purist amplifier at a modest cost. Maximising sound quality has been the aim, and the intensive research done by Rotel's UK team in this direction would appear to have been rewarded. The *840BX*, though not reviewed here, is similar but with higher output and an mc disc input.

A compact integrated amplifier of low profile appearance, it comes in satin black, with a fairly low nominal power rating of 25W (14dBW). However, a good load tolerance is claimed, and this was confirmed on test.

Another no frills design, both tone controls and filters have been omitted, likewise fuses and protection circuits have been removed from the signal path. Inputs include tape, tuner, CD/aux and disc (mm only). Rear panel sockets are phono, gold plated for disc, while reasonably solid connectors are provided for speaker connection, these large enough to take a decent size of wire.

Inside, construction is very tidy, essentially a single board, with the mains wiring properly terminated and shrouded. Two 8200μF capacitors provide a sizeable reservoir, while the direct coupled complementary output stage uses paralleled pairs of transistors to increase the current capacity as well as the overload margin. A 0.22 ohm resistor is placed in series with the output — a backstop against extreme overload such as a short circuit. ICs are used in the preamplifier stages together with selected audio components.

Sound quality

Aside from its moderate peak sound level, the panel rated this amplifier very highly. In fact its scores place it up among the select few, some of which cost as much as four times its price. Its trump card was a clear sound, sufficiently transparent to properly portray depth and ambience effects in stereo images. These were also of fine width and focus. It has an involving sound, yet is also musical and subtle. Bass was clean and quite firm, and the treble well controlled. Such a performance proved an embarrassment to many of the more costly separates included.

Via disc, only a marginal loss of sound quality was detected. Here it sounded a trifle lean and lightweight, but the depth, atmosphere, expressive power, focus and life all remained. This amplifier would justify a really good mm cartridge, even one which might cost as much as the *'BX* itself!

Lab results

The specified rating was comfortably exceeded with a fine power bandwidth shown of 15.7dBW

BEST BUY

at 8 ohms. The reduction into 4 ohms was moderate, while the 2 ohm pulsed output exceeded rated level at 14.5dBW. This was equivalent to 100W into 2 ohms, while peak current was very generous at ±15A. Distortion levels were moderate, especially with respect to the high frequency intermodulation. Input noise levels were good, and coupled with excellent input overload margins. The dc offsets at the speaker terminals were poorer than average but in practice should not give trouble.

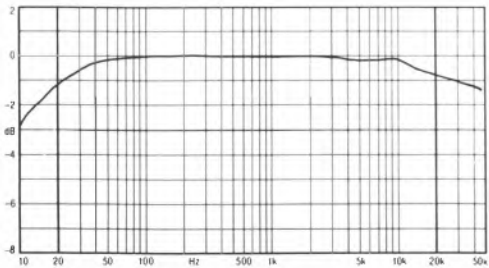
Channel separation was satisfactory via the disc input but should be much better via auxiliary particularly at 20kHz. Volume tracking and channel balance were both pretty good, while output impedance to the speakers was constant as well as moderate.

Input sensitivity and loading characteristics were sensible, (0.7mV disc, 45mV tuner). Over a 50Hz to 10kHz range the RIAA equalisation was very accurate, with some rolloff outside these limits; a mild subsonic and ultrasonic filtering.

Mains ripple was not particularly well rejected as the 40Hz power spectrum showed. Here the 100Hz line component was only 60dB down — one wonders how the *'BX* would sound if this were improved?

Conclusion

This latest Rotel again stormed through the listening tests. The *'BX* version has now definitely come of age and can be warmly recommended. Load tolerant, it also offered a respectable output plus a clear sound with excellent stereo. With a recommendation also for the mc-equipped *'840BX*, a Best Buy rating is the only logical conclusion!

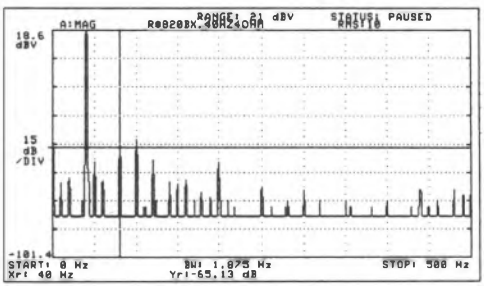


Disc eq accuracy and (right) power supply rejection

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.

GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			25W(= 14dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.9dBW	16dBW	15.7dBW
Both channels, 4ohm load	13.0dBW	13.7dBW	13.5dBW
One channel, 2ohms, pulsed	—dBW	14.5dBW	—dBW
Instantaneous peak current		+ 15A	– 15A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	– 66dB	– 74dB	– 55dB
Intermodulation, 19/20kHz, rated power, aux input			– 65dB
Intermodulation, 19/20kHz, at 0dBW, disc(mm)			– 73dB
Intermodulation, 19/20kHz, at 0dBW, disc(mc)			– —dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			– 74dB
Disc (mc) input (IHF, CCIR weighted)			– —dB
Aux/CD input (IHF, CCIR weighted)			– 82dB
Residual, unweighted (volume control at min)			– —dB
DC output offset			left 36mV, right 19mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	36dB	34dB	34dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	63dB	64dB	41dB
Aux input	62dB	48dB	24dB
Output impedance (damping)	0.24ohm	0.24ohm	0.25ohm
Channel balance, disc, at 1kHz			0.05dB
Volume/balance tracking	0dB	– 20dB	– 60dB
Aux input	0.1dB	0.8dB	0.1dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	—mV	50kohms 220pF
Disc (mc) input*	Phono	—mV	—ohms —pF
Aux input	Phono	—mV	50kohms 180pF
Output, pre-amp			>1V max, 3.8kohms
Disc equalisation error, 30Hz-15kHz			+ 0dB, – 0.6dB
Size (width, height, depth)			43 x 6 x 25cm
Typical price inc VAT			£140



Rotel RA-870

Rotel Hi-Fi, 25 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR
Tel (0908) 317707

Rotel's refinement of their larger amplifier designs has followed much the same path as the development of the current *RA-820BX* from the original *RA-820* budget amplifier. First launched for the 1983-4 season, the *RA-870* was originally a 'straight line' development of the 'conventional' tone control-equipped *RA-860*, and it was also designed to provide a higher-power option when augmented by an *RB-870* power amplifier. Rotel subsequently introduced the *RC-870* pre-amplifier to form a matching pair of separates with the *RB-870*. This logical progression has now been completed with a re-design of the *RA-870* to incorporate much of the *RC-870/RB-870* technology, and it now becomes in effect more or less a 'BX' version.

This is a no frills design, where normally redundant features have been abandoned in favour of direct signal paths and maximum sound quality. Modestly rated at 60W per channel, it may be set in bridged mono mode and used together with an *RB-870* power amp to give a system of typically 200W per channel. Channel balance adjustment is provided by the dual concentric volume control, friction-ganged. Two tape decks, moving-coil and moving-magnet cartridge, plus CD and a tuner may be connected via phono sockets. Speaker connection is by means of large binding posts.

Using two mains transformers, the output stage is in double mono form. Generously rated output transistors are used in parallel pairs, the configuration being direct-coupled complementary. Integrated circuits are employed in the pre-amp section, this mainly drawn from the well regarded RC-*870*.

Sound quality

Proving substantially loud on the maximum level test, the *'870* attained a comfortable 106dBA with negligible loss into 4ohms. Certainly justifying its price it achieved a 'good plus' on audition, with the CD input having a small lead on absolute quality.

On disc, it portrayed stereo images with a good sense of scale, with decent depth and ambience. Focusing was stable and clear with good stage width. Dynamics were fine, though the overall effect was slightly veiled and it was apparent that more absolute definition would certainly have helped here.

Via Compact Disc, the detail improved, and a worthwhile standard was achieved. Compared with the top examples, it remained slightly flattened in its representation of stereo depth perspectives, while the treble was a touch sibilant.

However, the bass was well above average and it handled high power levels with authority and control.

RECOMMENDED

Lab results

On peak programme rating this amplifier doubled its manufacturer's rating, reaching 20dBW. Even at 2ohms, it managed 20.3dBW (400W), this backed by a generous peak current capacity which exceeded 30A. Power bandwidth was exceptional, even into 4ohms. Throughout the lab tests the distortion figures were low and most of the input noise levels were also very respectable.

With negligible DC offsets, the output impedance was very low at around 0.06ohm. Input overload margins were ample, while channel balances were accurately maintained. The RIAA equalisation curve showed a well designed midband of high accuracy over a 50Hz to 20kHz bandwidth with some sensible tailored rolloff outside the band. The input characteristics were well ordered with sensible loadings and sensitivities.

Driven with a 40Hz input to thirds of rated power, into 4ohms, for the supply modulation test, the resulting spectrogram was tidy enough with the 100Hz component 76dB down. Fine channel separations were recorded.

Conclusion

Rotel's designers have learnt the lessons derived from the *'820* — their whole range has now been revitalised. All now attain a similarly high standard of sound quality, and offer a range of additional facilities as well as higher power outputs. The bridge mode option was a special feature of the *RA-870*, and if coupled with an additional *RB-870*, would make an economical high power (300W) system. As it stands the *RA-870* is well placed in the Recommended class.

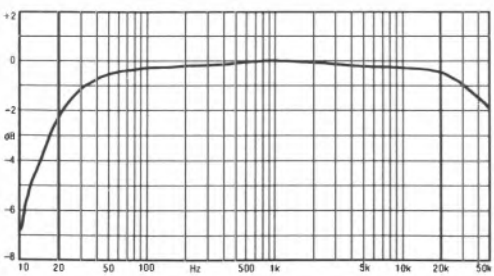
Test measurements

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.

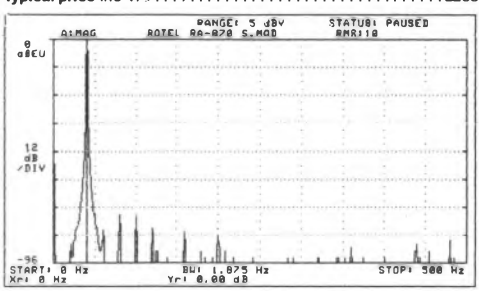
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			60W(=18dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.9dBW	19.2dBW	19.0dBW
Both channels, 4ohm load	17.6dBW	18.1dBW	17.9dBW
One channel, 2ohms, pulsed	—dBW	24.6dBW	—dBW
Instantaneous peak current		+30.0A	−40.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−78.0dB	−81.8dB	−71.3dB
Intermodulation, 19/20kHz, rated power, aux input			−73.7dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−77.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−78.5dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−74.6dB
Disc (mc) input (IHF, CCIR weighted)			−63.0dB
Aux/CD input (IHF, CCIR weighted)			−78.6dB
Residual, unweighted (volume control at min)			−82.5dB
DC output offset			left 11mV, right 3mV
DC offset, pre-amp			left 0mV, right 0mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	32.3dB	30.7dB	30.5dB
Disc (mc) input (IHF)	35.5dB	34.0dB	33.9dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	80.5dB	89.7dB	65.8dB
Aux input	84.3dB	81.1dB	58.4dB
Output impedance (damping)	0.06ohm	0.06ohm	0.07ohm
Channel balance, disc, at 1kHz			0.76dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.10dB	0.02dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.33mV	47kohms, 110pF
Disc (mc) input	Phono	0.048mV	180ohms, 0.5nF
Aux input	Phono	22mV	52kohms, 50pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) 10.5V max, −ohms
Disc equalisation error, 30Hz-15kHz +0dB, −1.02dB
Size (width, height, depth) 43 x 10 x 34cm
Typical price inc VAT £285



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Sansui AU-G30X

Sansui (UK) Ltd, Unit 10A, Lyon Industrial Estate, Rockware Avenue, Greenford, Middlesex
Tel 01-575 1133

Outwardly, this Sansui model is virtually identical to the *AU-G33X* tested in the 1985 *Amplifiers and Tuners* edition, but in fact the *AU-G30X* represents the result of considerable development work by Sansui's engineers in Japan during the intervening period.

While the earlier version demonstrated a good technical performance when tested in the laboratory, it did not fare well in the listening tests. But in effect, this model has now been totally redesigned, with redundant sections stripped away, and the remainder of the components and circuit layout optimised for improved sound. Sansui have, to borrow Rotel's terminology, done a 'BX' upgrade, refining the design by listening for audible improvements rather than aiming to improve measured performance.

With a rated power output of 45W (16.5dBW) per channel, the *'30X* is a fully equipped design, reasonably priced considering the specification and features on offer. It incorporates the usual control facilities such as speaker switching, bass and treble tone controls and filters, but bypass settings are provided for optimum sonic performance.

A higher-performance moving-magnet disc input stage has been included this time, while the old compromised moving-coil option of the *'33X* has now been omitted.

Based on a classic Sansui design, the power amplifier is a direct-coupled complementary configuration with transistor output devices and a well located central power supply. Internal heatsinks are used with through-flow ventilation.

Sound quality

Reversing our previous opinion, this time the amplifier scored a 'good plus' on the listening tests, which was a fine result for a model at this price level. On disc, the sound was robust, with firm stereo images, stably focused and exhibiting good depth and ambience. Offering decent clarity, good detail was also evident, while the sound improved further when using Compact Disc as the source. It produced fine bass, extended and powerful with good definition. Mid glare and treble 'grain' were held to low levels, and did not impair the good stereo performance. Good sound levels were possible without strain and it also proved load tolerant.

Lab results

As so often happens, there was little to show in the lab measurements that could account for the new sound. The audible change is the result of revised circuits, components and layouts and not necessarily an alteration in specification. Power output reached 19dBW peak (90W), while short term delivery into 2ohms was a very satisfactory 17.5dBW, with a good peak current reserve

BEST BUY

approaching 19A. High frequency distortion was slightly poorer than before — this being the only clue to reduced negative feedback in the output.

Input characteristics were fine, while the frequency responses were both wide and uniform. Channel balancing was very good, though a loss of channel separation was also evident at high frequencies. The output resistance was constant at a moderate 0.25ohms. The DC offsets were a little higher than average and could be reduced.

Good sound levels of 103dBA were achieved in the test system, while the 40Hz power spectrum showed a very clean results.

Conclusion

Sansui now have a middle-rank amplifier offering a competitive sound quality. A load-tolerant model, it also has a decent power output as well as versatile facilities, if and when required. The basic stereo performance was much better than before, with a sufficient sound quality improvement to bring the design out of the doldrums to full 'Best Buy' listing.

Note: The author privately assessed an early model supplied by the manufacturer, prior to this review.)

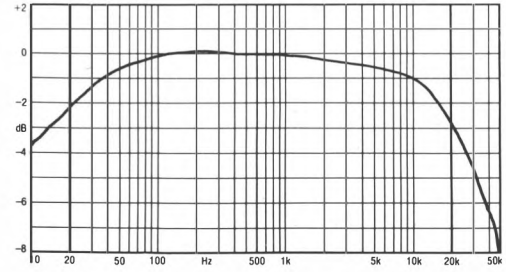
Test measurements

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.

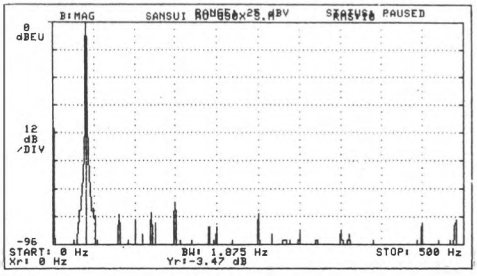
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			45W(=16.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	18.2dBW	18.3dBW	18.1dBW
Both channels, 4ohm load	15.9dBW	16.0dBW	16.5dBW
One channel, 2ohms, pulsed	—dBW	17.5dBW	—dBW
Instantaneous peak current		+18.5A	−20A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−77.4dB	−78.8dB	−68.8B
Intermo dulation, 19/20kHz, rated power, aux input			−90.0dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−87.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−68.2dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−73.0dB
Residual, unweighted (volume control at min)			−87.0dB
DC output offset			left 47mV, right 36mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	32.9dB	32.0dB	32.6dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	68.4dB	53.5dB	30.6dB
Aux input	77.9dB	53.0dB	30.3dB
Output impedance (damping)	0.26ohm	0.26ohm	0.25ohm
Channel balance, disc, at 1kHz			0.01dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.08dB	1.04dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	1.75mV	47kohms, 100pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	Phono	27.0mV	55kohms, 230pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 13.4V max, 100ohms
Disc equalisation error, 30Hz-15kHz +0.1dB, −1.9dB
Size (width, height, depth) 43 x 11 x 33cm
Typical price inc VAT £179



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Sondex Amadeus

Sondex Ltd, The Old Cottage, Hough Lane, Alderley Edge, Cheshire SK9 7JD
Tel (0625) 582704

To all intents and purposes, this amplifier replaces the Sondex *S230* and comes in at a typical price of £195. The press release describes this model as Class A, but in fact the small heatsinking and low levels of standing bias actually put it in the same A/B class as the original *S230* design. It also retains that amplifier's single power supply configuration, with capacitor coupling to the speaker load.

The *Amadeus* includes tone controls, and continues the Sondex plug-in board system whereby the disc setting may be programmed for a range of moving-coil and moving-magnet cartridges. Variations to suit particular applications may be obtained on request from the distributors, Aston Audio.

Nominal output rating is 35W per channel (15.5dBW) while it is intended that a larger version will become available at an extra charge. This will be the *Amadeus Gold* at £295, having the same line up of input facilities, namely disc, tape, tuner and Compact Disc/auxiliary.

Earlier Sondex amplifiers seemed fairly well protected, but in contrast, the available review samples of the *Amadeus* gave us considerable problems on test, blowing up when checked on full power. This is the reason for the omission of several important figures from the table (the testing set-up was checked by a Sondex director). However, it did happily survive the listening tests.

Sound quality

Building on the promising performance of the *S230*, the *Amadeus* scored 'good' in the listening tests. Sound levels of 101dBA were reached via the 8ohm test loudpspeaker (4ohm not tried).

On Compact Disc, the Amadeus showed a characteristic sweetness, with a subtle treble. The bass was above average while the coloration levels were mild. It sounded tidy with good stereo focus and depth, but with some restriction on width. Transients were good though a slight loss in dynamic drive was evident.

Via disc, the pleasant musical character remained, but with some loss of detail. The mild lack of drive was also more evident via this input. More bass attack and power would be welcome here. Stereo images were nicely formed, again with good focus and a respectable quota of depth and ambience.

Lab results

The only continuous power rating we managed to achieve on test was the figure of 16.1dBW for the 8ohm load at 1kHz, one channel driven — actually the same as for the *S230*. For the record, that amplifier managed a fair 12dBW into 2ohms on peaks, with a peak current of +12A. −9A, the *Amadeus* should be comparable, once settled down in production.

Distortion levels were unexceptional, averaging

0.2%, while the disc input intermodulation results were dependent on the restricted overload headroom present on these inputs. For example, for moderate distortion, the overload point at 20kHz, moving magnet, was 0dB. Properly matched, a cartridge might just be satisfactory but in my view, these figures were borderline. Input noise levels were fine, and at the power output terminals the DC offset was zero.

Good channel separation figures were obtained but the channel balance was not so good, at up to 2dB out with the volume control at −20dB, and almost 10dB in error at −60dB. The RIAA equalisation was extremely accurate from 50Hz to 15kHz, with sensible tailoring beyond these extremes. On the power test with 40Hz into 4ohms at two thirds level, the amplifier produced an average result for power supply rejection.

Conclusion

While some data is missing from the tests, the *Amadeus* would seem to be a derivative of the *S230*. On sound quality alone it would qualify for a recommendation but we have reservations concerning the input overload margins and the apparent fragility of the output stage, which at present is inadequately protected. It is hoped that this will be resolved in actual production.

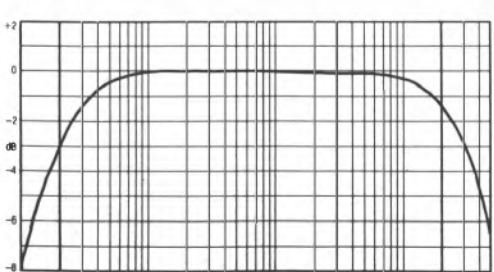
Test measurements

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.

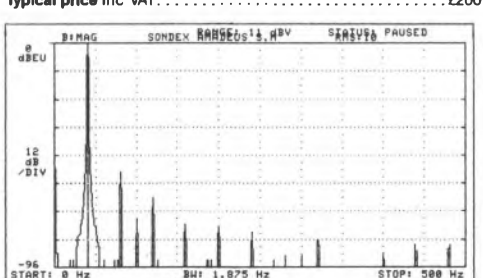
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			35W (= 15.5dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	n/a dBW	16.1dBW	n/a dBW
Both channels, 4ohm load			see text
One channel, 2ohms, pulsed			see text
Instantaneous peak current			see text
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−59.9dB	−56.2dB	−52.4dB
Intermodulation, 19/20kHz, rated power, aux input			−53.6dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−37.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−40.6dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−75.5dB
Disc (mc) input (IHF, CCIR weighted)			−69.5dB
Aux/CD input (IHF, CCIR weighted)			−78.8dB
Residual, unweighted (volume control at min)			−74.2dB
DC output offset			left 0mV, right 0mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	16.0dB	12.7dB	0dB
Disc (mc) input (IHF)	7.8dB	12.6dB	1.2dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	66.8dB	60.9dB	58.1dB
Aux input	63.3dB	64.5dB	58.3dB
Output impedance (damping)	0.68ohm	0.35ohm	0.36ohm
Channel balance, disc, at 1kHz			1.12dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.47dB	1.74dB	9.50dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.69mV	—kohms, —pF
Disc (mc) input	Phono	0.13mV	—ohms, —nF
Aux input	Phono	325mV	—kohms, —pF
Power amp	— mV	—kohms, —pF	

Output, pre-amp (tape) 9.0V max, —ohms
Disc equalisation error, 30Hz-15kHz +0.04dB, −1.31dB
Size (width, height, depth) 43 x 6 x 27cm
Typical price inc VAT £200



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Sony TA-AX320

Sony UK Ltd, Sony House, South Street, Staines, Middlesex TW18 4PF
Tel Staines 61688

While th e price of this amplifier definitely puts it into the budget category, Sony's specification includes a relatively substantial 55W (17.5dBW) per channel power rating. In the event, the lab tests showed even this to be quite a conservative rating.

Essentially a straightforward integrated design, the *TA-AX320* is distinguished by an unusual fascia layout. The front panel sports an interesting array of controls which have been styled to completely avoid the appearance of the usual rotary variety. Consequently, all the selectors for source, tape inputs and outputs and so on, are push buttons, while the bass and treble tone controls, volume and balance, are all sliders — which I think are harder to operate than normal rotary controls.

Connections and switching are provided for two sets of loudspeakers, and there are comprehensive arrangements to facilitate cross-dubbing between several tape and video sources if desired. The analogue disc input is for moving-magnet cartridges only; no moving-coil facility is provided.

Inside, the construction has been simplified by the use of two STK 4036X hybrid power amp modules (these combine an integrated circuit with discrete output devices in a single enclosure). The mains transformer is of generous size and the unit is founded on one main printed circuit board. The mains switch terminals are unshrouded, unfortunately. Input socketry is the usual array of RCA phonojacks, with the speaker outlets, spring clips. A standard headphone outlet is fitted on the front panel.

Sound quality

In the test system, the *TA-AX320* reached a respectable 103dBA on the maximum level test, but judging from the completed listening test results, this Sony amplifier must be rated 'below average' on general sound quality.

Via the Compact Disc input, the audio balance appeared bright with a hard glaring mid register allied to a noted 'boxy' coloration. Stereo depth was suppressed and some programme detail was masked. Focus was presentable and the amplifier did show some drive and life.

Via analogue disc, a further loss of detail and focus was noted with a degree of mid projection, and some 'edge' became noticeable in the treble. Some musical interest still remained, however. The bass rated as 'weak' via both inputs.

Lab results

With a continuous output of around 80W 8ohms (18.5dBW) the *320* almost reached 100W peak though the loss into the lower impedances was a little greater than usual for example, 4dB down by 2ohms. The peak current figures were quite presentable as recorded in the table, but these

were based on a shorter-than-usual duty cycle, and the current figures were halved with the normal 20 cycle test.

The power spectrum result was impressive, with an excellent suppression of 50Hz supply harmonics. At low frequencies, distortion levels were fine but some deterioration was noted at high frequencies. The intermodulation results for disc were poorer than average particularly in view of the satisfactory input overload margins. Input noise levels were good while the power amplifier output showed negligible values for output impedance and DC offset.

Channel separations were surprisingly consistent at around 53dB, Channel balances were well maintained over a wide range of volume settings. All the input characteristics were satisfactory while the RIAA equalisation proved to be commendably accurate, and did not give an easy reason for the listening test results.

Conclusion

This integrated amplifier seemed to give an untidy performance particularly in terms of its sound quality. The power rating was quite generous for the money, but we found the performance was unimpressive; in this case, no recommendation is appropriate.

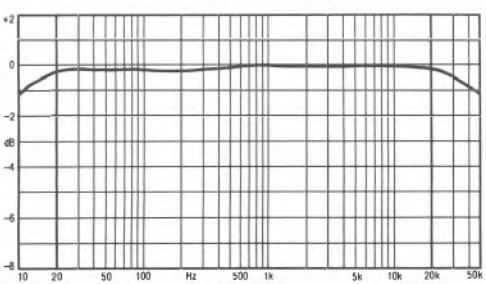
Test measurements

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.

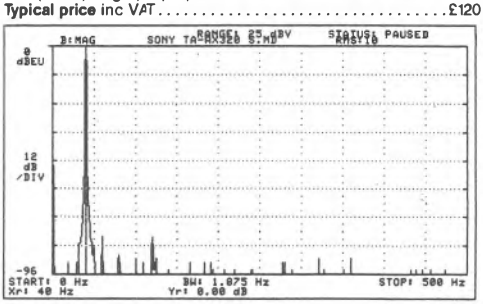
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			55W(=17.5dBW)
Poweroutput	20Hz	1kHz	20kHz
One channel, 8ohm load	18.3dBW	18.7dBW	18.5dBW
Both channels, 4ohm load	14.9dBW	16.2dBW	15.9dBW
One channel, 2ohms, pulsed	—dBW	15.6dBW	—dBW
Instantaneous peak current		+13A	−14A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−75.8dB	−82.4dB	−55.8dB
Intermodulation, 19/20kHz, rated power, aux input			−73.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−55.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−67.8dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−71.5dB
Residual, unweighted (volume control at min)			−76.0dB
DC output offset			left 1mV, right 1mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	29.7dB	28.9dB	28.1dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	55.7dB	56.0dB	51.1dB
Aux input	53.0dB	53.7dB	51.5dB
Output impedance (damping)	0.16ohm	0.16ohm	0.24ohm
Channel balance, disc, at 1kHz			0.42dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.01dB	0.33dB	0.12dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.22mV	43kohms, 235pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	Phono	16.0mV	160kohms, 100pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) ..... 9.8V max, 487ohms
Disc equalisation error, 30Hz-15kHz ..... +0.03dB, −0.14dB
Size (width, height, depth) ..... 43 x 9 x 25cm
Typical price inc VAT £120



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Sugden A25

JE Sugden & Co Ltd, Valley Works Station Lane, Heckmondwike, West Yorks WF16 0NF
Tel (0924) 404088

Recent developments from Sugden have included further refinements to the *C128* pre-amplifier, which along with the matching *P128* power amp, continues to be recommended in this edition (see summary reviews), and the launch of the *A25*, a relatively low-cost integrated model claiming only a rather modest power output but built to high standards.

Finished in satin black with white legends, the *A25*, is effectively the budget model of Sugden's range. The specification quotes a rated power output of 25W (14dBW) per channel, and only basic facilities are provided — on the other hand, the design has aimed to produce a superior sound quality by concentrating on direct signal paths and the use of good quality components. Disc (moving-magnet cartridges only) and auxiliary inputs are catered for, while the rear panel also carries 4mm sockets to provide for loudspeaker connection.

Inside, the amplifier is based on a neat single-board construction, with star grounding arrangements. A single power supply is shared between channels, but there are well-sized 10,000μF reservoir capacitors. Surprisingly, for a model designed and built in the UK, the internal mains connections have been left unshrounded.

In this class A/B amplifier, the output stage is direct-coupled to the load, the source a pair of complementary MosFet output devices. A good quality volume control is placed between the pre- and power stages, the low level equalisation and amplification accomplished by the ubiquitous NE 5534 integrated circuits. These are fed from regulated supplies and overall the design certainly looked promising.

Sound quality

Unfortunately, the visual promise was not carried through to audition, where the overall rating on listening test scores placed it in the lowest 'poor' category. On Compact Disc, it was below average with vague stereo images, lacking in real focus or definition. The treble seemed dulled and veiled, the bass forward and tending to boominess. Tonally quite pleasant, it nonetheless failed to reproduce depth or ambience properly, and the dynamic contrasts present in the programme were diluted.

Via moving-magnet, the sound deteriorated still further. Treble quality verged on a blur, transients were soft and slow, while the bass definition was also poor. The dynamic loss took away much of the interest and life in the programme we used, while mild transformer hum was also audible from the power supply.

Lab results

More powerful than the specification indicated, the *A25* could achieve sound levels of 101dBA.

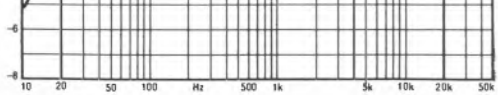
The peak programme power, 8ohms, reached 16.5dBW, about 50W.

Continuous power levels of 15.4dBW were attained with a good power band-width into 8ohms. However the output fell 3dB into 4ohms, suggesting mild power supply limitation. Peak current was rather unbalanced at +20A, −13A, but even the lower limit was sufficient in view of the power rating.

No problems were experienced with the distortion or the intermodulation results. Input overload margins were ample, at typically 34dB IHF. Noise levels were very good while the DC offset at the output was held to realistic limits. The stereo separation results were pretty good via disc and still more than satisfactory via CD. Output impedance was negligible at about one tenth of an ohm, and good channel balance was established. On RIAA equalisation a fine curve was plotted, broadly uniform yet nicely tailored at the band edges. Input characteristics were good. On the power modulation test, 40Hz at two thirds power into 4ohms, the supply harmonics were well rejected, as can be seen in the spectrum.

Conclusion

In theory Sugden's designer seems to have done all the right things and the solid lab performance is a testament to this aspect of the *A25*. However, the sound quality was really disappointing, and without more detailed analysis I can give no immediate explanation, but unfortunately, on the basis of our review sample, it meant no recommendation was possible.



Disc input: RIAA equalisation accuracy

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.

GENERAL DATA — Integrated amplifier

Power output

Rated power into 8ohms, maker's spec.			25W(=14dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	15.3dBW	15.4dBW	15.3dBW
Both channels, 4ohm load	11.6dBW	12.2dBW	12.1dBW
One channel, 2ohms, pulsed	—dBW	15.1dBW	—dBW
Instantaneous peak current		+20A	−13A

Distortion

Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−73.4dB	−73.6dB	−60.1dB
Intermodulation, 19/20kHz, rated power, aux input			−64.1dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−78.0dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB

Noise

Disc (mm) input (IHF, CCIR weighted)	−74.0dB
Disc (mc) input (IHF, CCIR weighted)	—dB
Aux/CD input (IHF, CCIR weighted)	−78.1dB
Residual, unweighted (volume control at min)	−81.5dB
DC output offset	left 20mV, right 13mV
DC offset, pre-amp	left —mV, right —mV

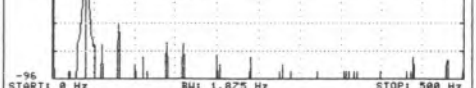
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	36.4dB	34.3dB	34.2dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB

Stereo separation

Disc input (mc)	57.7dB	73.1dB	56.6dB
Aux input	58.5dB	59.6dB	35.4dB
Output impedance (damping)	0.10ohm	0.10ohm	0.14ohm
Channel balance, disc, at 1kHz			0.03dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.10dB	0.04dB	0.73dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.54mV	47**kohms**, —pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	Phono	45.5mV	48kohms, —pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) 12.2V max, —ohms
Disc equalisation error, 30Hz±15kHz +0dB, −1.0dB
Size (width, height, depth) 40 x 7 x 29cm
Typical price inc VAT £150



Power supply rejection, 40Hz input

Tandberg 3008A/3006A

Tandberg Ltd, Revie Road, Elland Road, Leeds LS11 8JG
Tel (0532) 774844

Recently upgraded, the well-equipped pair of separates from Tandberg's prestigious '3000' series was completely retested for this edition. Now carrying an 'A' suffix, the *3006* power amplifier appeared in earlier form in previous *Amplifiers* issues, along with the *3002* pre-amplifier, predecessor of the *3008A* tested here.

Both finish and build quality are to the highest standards in these products. The *3008A* pre-amplifier is comprehensive in its features, offering tone controls along with numerous input facilities; there are two tape input sections, while the disc input caters for both moving-coil and moving-magnet cartridges, and there are the expected Compact Disc, auxiliary and tuner options. The design employs all-discrete circuitry throughout, with extensive regulation for the power supplies, fine component quality being evident throughout.

Slim but purposeful in appearance, the *3006A* is a large power amplifier, rated at 150W (22dBW) per channel. A high current capability promises a good performance into a wide range of loadings. Output configuration is direct-coupled complementary, while the large central transformer is a toroidal design, this helping to maintain the low visual profile of these units. Separated reservoir capacity is provided for each power channel, aiding dynamic separation. The outputs are 4mm binding posts/sockets, the type fitted being a little small in view of the ultimate power capacity.

Sound quality

This proved to be a very big power amplifier indeed, and on the level test it achieved 109dBA into the standard speakers with very little loss into 4ohms. Mechanical hum was held to a low level and in the listening tests, the amplifier seemed to play effortlessly loud on programme.

The standard of sound quality was consistent both disc and auxiliary sockets, with a respectable rating of 'good plus' recorded overall. This powerhouse also produced fine stereo images with good focus depth and clarity. Its portrayal of fine musical detail was encouraging, even if its tonal balance tended to be slightly thin and clinical. Bass, mid and treble registers each set a good standard, though the whole was not perfectly integrated through the frequency range. Dynamics were well represented. On moving-coil, a trace of treble 'fizz' was noted — not a fierceness, more a softening of detail in this range.

Lab results

Rated power was met easily over the power bandwidth while the maximum 8ohm power exceeded 300W on programme peaks with 23.5dBW still maintained into 2ohms. Superb peak current outputs of ±60A were measured, making this a highly load tolerant design.

Both the harmonic and intermodulation distortion results were at negligible levels, with the

combination sailing through the lab testing. Input noise readings were very low, and first-rate input overload margins were noted. The power amplifier output impedance was low but the 68mV DC offset measured on one channel was a little on the high side. Channel separations were fine, while highly accurate channel balances were maintained. The RIAA equalisation was very uniform; the bandwidth limits occurred at less than 5Hz and at 142kHz, this perhaps a mite excessive. Input and output characteristics, including sensitivities and loading were all fine and the pre-amp was capable of matching any power amplifier.

Very good results were obtained on the 40Hz power intermodulation analysis and the supply harmonics are almost undetectable on the graph.

Conclusion

This well-matched pair delivered a consistently good sound quality. They sailed through the lab test programme, with the power amp delivering well over 250W programme, offering high sound levels with a very fine load tolerance. Both build quality and finish were fine. The pricing precludes recommendation at the assessed sound quality level, but these are good products worthy of serious consideration.

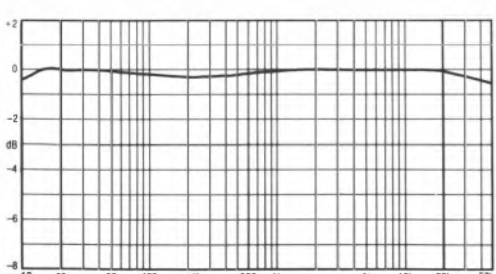
Test measurements

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.

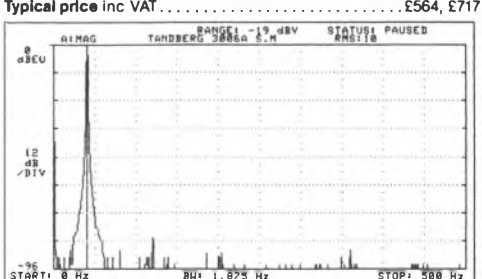
GENERAL DATA	Pre- and power amplifier		
Power output			
Rated power into 8ohms, maker's spec	150W(=22dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	23.3dBW	23.4dBW	23.2dBW
Both channels, 4ohm load	20.8dBW	21.2dBW	21.1dBW
One channel, 2ohms, pulsed	—dBW	29.0dBW	—dBW
Instantaneous peak current		+60A	−60A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−73.7dB	−73.9dB	−72.1dB
Intermodulation, 19/20kHz, rated power, aux input			−82.9dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−81.3dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			−90.0dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−72.2dB
Disc (mc) input (IHF, CCIR weighted)			−68.0dB
Aux/CD input (IHF, CCIR weighted)			−76.0dB
Residual, unweighted (volume control at min)			−84.5dB
DC output offset	left 68mV, right 23mV		
DC offset, pre-amp	left 0mV, right 0mV		
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	36.9dB	36.6dB	34.8dB
Disc (mc) input (IHF)	31.0dB	30.8dB	30.3dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	81.2dB	74.2dB	49.5dB
Aux input	76.7dB	62.9dB	38.1dB
Output impedance (damping)	0.04ohm	0.04ohm	0.05ohm
Channel balance, disc, at 1kHz			0.25dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.09dB	0.22dB	0.23dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.23mV	48kohms, 220pF
Disc (mc) input	Phono	0.026mV	150ohms, 10.4nF
Aux input	Phono	15.3mV	15kohms, 50pF
Power amp	Phono	112mV	110kohms, 200pF

Output, pre-amp (tape) 13.4V max, 220ohms
Disc equalisation error, 30Hz-15kHz +0.04dB, −0.24dB
Size (width, height, depth) 43.5 x 8.5 x 39cm, 43.5 x 8.5 x 38.5cm
Typical price inc VAT £564, £717



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

RECOMMENDED

Tannoy SR-840 power amplifier

Tannoy Ltd, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB Tel (0494) 450606

This superbly built studio-class amplifier has a fine pedigree and is in part derived from the Tresham line, as this company is now part of Tannoy. The *840* does not have phono socket inputs, but instead XLR and ¼in jack inputs are provided, while speaker output is via massive 30A binding posts. A massive creation of considerable weight, it comes equipped with one of the largest toroidal mains transformers that I have ever seen. The specification discusses ratings down to 2ohms continuous per channel, and the transformer is commensurately rated for this arduous duty. The basic spec is 250W per channel, or 900W mono bridged.

A direct-coupled design, the output is full complementary MosFet, with paralleled arrays of output devices to share the load. Two separate 15,000μF high current reservoirs are provided for each channel.

Sound quality

Mechanical hum was moderate, while very high, unstrained sound levels were possible. This was one of the biggest amps tested and 111dBA was attained into 8ohms, with 110dBA into 4ohms — a powerhouse indeed!

Few doubts were expressed on sound quality and on the listening test scores, the amplifier established a 'very good' overall rating. Focus was fine, but with a slight constriction of stereo depth and image width. The treble register was musical with good definition, while the bass was effortlessly powerful and extended, yet with very good articulation and speed. Tonally, the mid was judged to be slightly 'clinical', but this did not detract much from the rating. Compared with the best examples, it could sound slightly veiled and lacking in 'air' but conversely it handled dynamics well, and gave an impression of power and ease, a relaxing effect conducive to low levels of 'listening fatigue'.

Lab results

Considering its high output level, the peak output current was somewhat lower than expected though at over 40A this should not give any trouble except with reactive loads below 3ohms, or resistive loads below 2ohms. Peak 8ohm levels exceeded 500W per channel, and this level was held even into 2ohms. Clearly a conservatively rated model, the 4-8ohm bridged output level will typically lie in the 1,500 to 1,800W range!

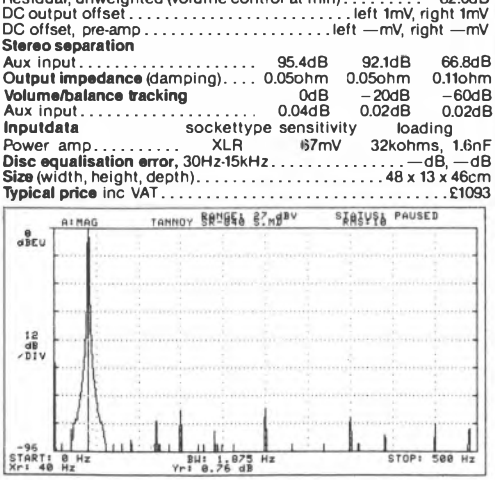
Measured distortions were negligible, noise levels fine and DC offset at the output was virtually zero. Channel separation was very good, with an output impedance at a very low level. Channel balance was held to a typical 0.02dB. It represented a very easy pre-amplifier load with 67mV required for the IHF 1watt output, and by our measurements, full clipping would require

around 2V. Tested for power modulation, a good result was shown in the spectrum analysis with the supply harmonics well suppressed at around −80dB.

Conclusion

This very powerful, professional amplifier has passed the critical listening test associated with more delicate exotics intended for 'audiophile' hifi use. Lab performance was very good, while the load tolerance was fine, and the power output exceptional. Its very good sonic rating probably means that this amplifier was the best tested of its power rating. Given its high standard of engineering, it represented good value and is recommended.

GENERAL DATA			Power amplifier
Power output			
Rated power into 8ohms, maker's spec			250W(=24dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	25.0dBW	25.2dBW	24.8dBW
Both channels, 4ohm load	23.8dBW	24.1dBW	23.7dBW
One channel, 2ohms, pulsed	—dBW	26.4dBW	—dBW
Instantaneous peak current		+45.0A	−40.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−80.9dB	−80.6dB	−68.3dB
Intermodulation, 19/20kHz, rated power, aux input			−89.5dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−108.8dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Aux/CD input (IHF, CCIR weighted)			−83.0dB
Residual, unweighted (volume control at min)			−82.0dB
DC output offset			left 1mV, right 1mV
DC offset, pre-amp			left —mV, right —mV
Stereo separation			
Aux input	95.4dB	92.1dB	66.8dB
Output impedance (damping)	0.05ohm	0.05ohm	0.11ohm
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.04dB	0.02dB	0.02dB
Inputdata	sockettype	sensitivity	loading
Power amp	XLR	67mV	32kohms, 1.6nF
Disc equalisation error, 30Hz-15kHz			—dB, —dB
Size (width, height, depth)			48 x 13 x 46cm
Typical price inc VAT			£1093



Power supply rejection, 40Hz input

Technics SU-V1X

Panasonic (UK) Ltd, 300-318 Bath Road, Slough, Berks
Tel (0753) 34522

Moderately priced, the *SU-V1X* offers a specified power rating of 40W (15.6dBW), though in practice it was found to be rather more powerful than this — as the test results confirmed. As specified by the manufacturer, this model looks to be the less powerful brother of the *SU-V2X* (which was fully reviewed in the last Amplifiers and Tuners issue and is now included in the *Summary Reviews* section), but in practice the *SU-V1X* now apparently offers more power than our earlier *'2X* sample did, though the latter demonstrated high peak current capacity.

Finish and appearance are excellent, and the amplifier is well equipped with facilities. Inputs are provided for two tape decks, Compact Disc video/auxiliary, tuner, and analogue disc — this for moving-magnet cartridges only. Two pairs of loudspeakers may be connected, and a headphone outlet is provided via the usual ¼in front panel jack. All inputs are via the customary RCA phono sockets, the speaker terminals being the spring-clip type.

Front panel controls include tone controls, offering ±10dB adjustment of bass and treble, which can be switched out of circuit by the defeat switch if desired, plus a loudness button, muting switch and balance control.

Inside, the power amplifier circuit conforms to Technics' 'New Class A' configuration, whereby a microprocessor controls the output bias level more accurately — a sliding bias scheme. The amplifier is largely designed with integrated circuits, while the output stage comprises a single hybrid chip (Technics SV1 2003A) for both channels. This is mounted on a heatpipe, thus allowing generous through ventilation for heat disssipation.

The generously-sized mains transformer feeds two 6,800μF reservoir capacitors. Internal mains wiring to the switch contacts is unshrounded; this model has a speaker impedance selector switch mounted on the rear panel, which reduces the peak level for 4ohm speaker systems, theoretically guarding against overheating.

Sound quality

Reasonable sound levels were attained on the maximum level test, reaching 102dBA into 8ohms, and 101dBA into the 4ohm adverse loading, a good result from the point of view of load tolerance. On listening tests it was thought marginally superior via the auxiliary input, where stereo focus was considered to be average but the depth effect was poor. Detail was represented quite well, but with a 'coarsened' mid quality coupled with some 'grainy' coloration in the treble. More weight and attack would have been welcome in the bass.

On disc, via the cartridge input it sounded 'brash' and brighter, but not severely so. On both inputs, the dynamic contrasts present in the

music appeared rather restrained, lacking life and impact.

Lab results

Its peak output was quite healthy at 19dBW, and surprisingly, in view of the rear panel impedance switch, it slogged away into 2ohms, with a really worthwhile 18dBW level. Realistic peak currents of ±16.7A were developed. The distortion results were so low as to be ruled out as a sonic factor, these fine for both harmonic and intermodulation even if the latter rose a little via the disc input. Input noise levels were satisfactory and the disc input overload was ample at 30dB.

Measured at the power amplifier output, the DC offset was satisfactory while the output impedance was negligible. On channel balance and volume tracking it measured very well, while stereo separations were also above average. Input sensitivities and loadings were all in order, while the 40Hz power spectrum result was excellent, with negligible distortion and power supply harmonics invisible. No lab evidence for the 'brighter' disc sound could be found; the RIAA equalisation proved to be very accurate, as the printed curve illustrates.

Conclusion

A healthy, load-tolerant amplifier, this model proved to have an accurate technical performance as demonstrated by the lab tests, but was let down by the sound quality — its ratings in our listening tests were no disaster, but unimpressive in its price category. As such, it did not in our view, offer sufficient value for a recommendation.

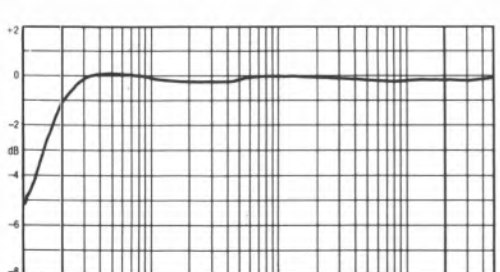
Test measurements

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.

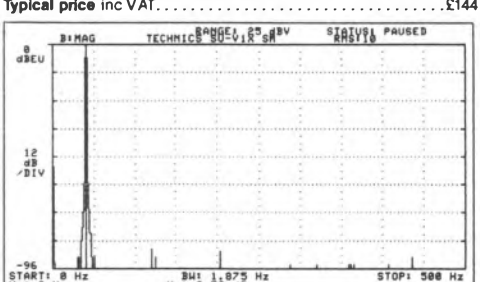
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			40W(=15.6dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.7dBW	18.1dBW	18.0dBW
Both channels, 4ohm load	14.3dBW	15.3dBW	15.3dBW
One channel, 2ohms, pulsed	—dBW	18.0dBW	—dBW
Instantaneous peak current		+16.6A	−16.8A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−86.5dB	−88.0dB	−77.4dB
Intermo dulation, 19/20kHz, rated power, aux input			−107.8dB
Intermo dulation, 19/20kHz, at 0dBW, disc (mm)			−65.6dB
Intermo dulation, 19/20kHz, at 0dBW, disc (mc)			n/a dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−64.6dB
Disc (mc) input (IHF, CCIR weighted)			n/a dB
Aux/CD input (IHF, CCIR weighted)			−66.7dB
Residual, unweighted (volume control at min)			−90.2dB
DC output offset			left 30mV, right 12mV
DC offset, pre-amp			left n/a mV, right n/a mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	32.1dB	31.3dB	30.6dB
Disc (mc) input (IHF)	n/a dB	n/a dB	n/a dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	64.1dB	70.1dB	50.5dB
Aux input	72.9dB	73.6dB	50.0dB
Output impedance (damping)	0.14ohm	0.14ohm	0.17ohm
Channel balance, disc, at 1kHz			0.70dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.39dB	0.81dB	0.52dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.41mV	43kohms, 170pF
Disc (mc) input	n/a	n/a mV	n/a ohms, n/a nF
Aux input	Phono	23.7mV	46kohms, 90pF
Power amp	n/a	n/a mV	n/a kohms, n/a pF

Output, pre-amp (tape) 9.9V max, —ohms
Disc equalisation error, 30Hz-15kHz +0.08dB, −0.16dB
Size (width, height, depth) 43x11x29cm
Typical price inc VAT £144



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Trio KA-54

Trio Electronics UK Ltd, 17/19 Bristol Road, Metropolitan Centre, Greenford, Middlesex UB6 8UP
Tel 01-575 6030

Budget amplifier models have historically been one of the strengths of the Trio brand — a name, incidentally, known only in the UK, as throughout the rest of the world the company's products are marketed under the Kenwood banner — and in the past many Trio models have offered good value and rugged build quality at the lower end of the price spectrum. Our product entry deadlines for the last edition coincided with the changeover period as the previous UK distributor handed over to the newly set-up Trio UK division, and so we were unable to represent the range in that issue. With Trio apparently now going from strength to strength, we were happy to be able to include one of their latest budget amplifiers this time round.

Though not quite the least expensive model tested, the Trio *KA-54* comes in at just under £100. In return for this modest asking price, it offers a substantial rated output of 55W (or 17.3dBW), plus a good range of the essential features and facilities. Finished in the now almost universal satin black, its straightforward fascia has clear illuminated indication of the main control functions. Inputs are provided for the usual tape deck, tuner and disc (moving-magnet cartridge only), plus Compact Disc and an additional auxiliary/video socket. Bass and treble tone controls are fitted, along with a 'loudness' button. A headphone jack is also provided.

On the rear panel, two pairs of speakers may be connected with termination made via turn-lock connectors. As usual, phono sockets are used for the low-level inputs and tape record-out.

The power amplifier design incorporates largely discrete circuitry, with a direct-coupled complementary output stage. The circuits are based on five interconnected printed circuit boards — surely this is too many for a product in this price range? As with so many recent amplifiers, the internal mains switch wiring is left unshrouded, this at variance with the British Standards recommendation. A single central power supply feeds both channels.

Sound quality

Capable of quite decent sound levels, the *KA-54* achieved a 102dBA loudness into 8ohms, and 101dBA into 4ohms. Mechanical hum levels were low.

On the listening tests, this amplifier fared badly, with an overall rating of 'poor'. Via the Compact Disc input, the sound was thought marginally superior to the result via the analogue disc input, however.

Stereo images were weakly focused and exhibited little depth. The bass seemed lumpy, lacking in definition or extension, and the reproduction had almost no pace or excitement. Dynamics were suppressed. Via disc, the bass was softer

still, with a further loss of detail and a dulled 'airless', muzzy treble. It sounded 'filtered' with a loss of immediacy and attack. On the plus side, it was not unpleasant or unduly aggressive.

Lab results

Peaking at 18.5dBW, healthy output levels were achieved and at rated power, the bandwidth was very good. Output fell almost 3dB into 4ohms under continuous drive, but recovered on the peak duty cycle at 2ohms. With a satisfactory ±10.5A peak current, this amplifier proved quite load tolerant.

Measured for harmonic and intermodulation distortion over a wide frequency range, the test results were very good and do not need further comment. Input noise levels were satisfactory, while good input overload figures were obtained. Stereo separation was below average at the higher frequencies.

Source impedance at the power amplifier was moderate and the output offset satisfactory. Channel balance was fine. An exemplary RIAA equalisation curve was also demonstrated, as can be seen in the graph. The power modulation result, shown in the spectrum analysis, was quite satisfactory.

Conclusion

The lab performance of this amplifier was quite good, and should be allied to a good sound quality. But unfortunately the results of our listening tests were rather disappointing, and clearly precluded any recommendation.

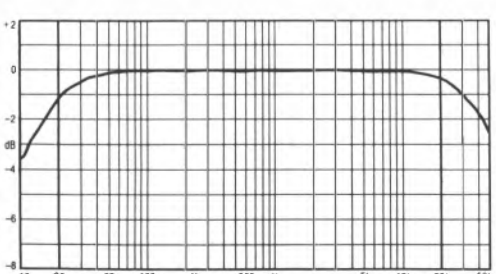
Test measurements

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.

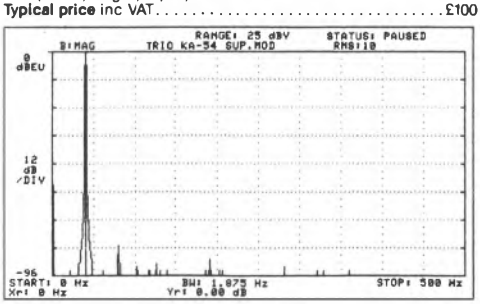
GENERAL DATA			Integrated amplifier
Power output			
Rated power into 8ohms, maker's spec			55W(= 17.3dBW)
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	17.5dBW	17.5dBW	17.3dBW
Both channels, 4ohm load	14.0dBW	14.8dBW	14.7dBW
One channel, 2ohms, pulsed	—dBW	17.1dBW	—dBW
Instantaneous peak current		+11.0A	−10.0A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−84.0dB	−87.6dB	−75.2dB
Intermodulation, 19/20kHz, rated power, aux input			−72.9dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			−84.4dB
Intermodulation, 19/20kHz, at 0dBW, disc (mc)			—dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−69.2dB
Disc (mc) input (IHF, CCIR weighted)			—dB
Aux/CD input (IHF, CCIR weighted)			−72.4dB
Residual, unweighted (volume control at min)			−84.2dB
DC output offset			left 19mV, right 11mV
DC offset, pre-amp			left —mV, right —mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	30.3dB	39.0dB	28.7dB
Disc (mc) input (IHF)	—dB	—dB	—dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input (mc)	70.9dB	51.6dB	26.5dB
Aux input	68.3dB	52.8dB	27.9dB
Output impedance (damping)	0.25ohm	0.25ohm	0.25ohm
Channel balance, disc, at 1kHz			0.14dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.13dB	0.00dB	1.65dB

Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.38mV	42kohms, 200pF
Disc (mc) input	—	—mV	—ohms, —nF
Aux input	Phono	24mV	53kohms, 900pF
Power amp	—	—mV	—kohms, —pF

Output, pre-amp (tape) 9.1V max, 330ohms
Disc equalisation error, 30Hz-15kHz +0dB, −0.4dB
Size (width, height, depth) 42 x 11 x 29cm
Typical price inc VAT £100



Disc input: RIAA equalisation accuracy



Power supply rejection, 40Hz input

Yamaha A-320

Natural Sound Systems Ltd, Unit 7, Greycaine Road, Watford WD2 4SB
Tel (0923) 36740

Styled in smart satin black, the budget *A320* was originally launched as a 'purist' version of the fully-equipped *A300*, being essentially identical except for absence of tone controls. As well as a slight cost saving, the *A320* was claimed to offer improved sound quality, and indeed on our initial auditioning for the 1985 edition, the *320* did sound a mite clearer than the *300*, which is now discontinued. However, in all technical aspects the two models were indistinguishable, and the report which follows may be taken as referring to both.

Internally the layout was very tidy, partially reflecting a need to minimise the internal circuitry and components to meet a cost target. A single printed circuit board is used with a large aluminium 'U' bracket as a heatsink. The common power supply is modestly sized, and the pre-amp, usual line buffer stage is omitted. The power amplifier section has a higher than normal gain, and has the tone control circuits incorporated in its feedback loop. The output stage is direct coupled complementary, with a relay for switch on muting. Disc amplification for the moving-magnet input is carried out by the usual dual integrated circuit with series feedback equalisation.

Construction is to the usual Yamaha standard and is of good quality overall.

Sound quality

The *A300* scored 'above average' on the listening test sessions, this a fine result at the price. While it demonstrated a slightly 'hard' tonal quality, tending to place the stereo image rather up front, at the same time it showed promising depth and ambience and good stereo focus.

Via the disc input, the bass was a little soft but not seriously so, and programme dynamics were portrayed with greater faithfulness than usual at this price level.

Via the auxiliary input the rendition of depth and space was encouraging, with once again a reasonably solid central image focus. Detail was good with a pleasing separation of complex musical strands. In the bass it lacked the real power and definition of the larger models, but performed quite well nonetheless. It sounded satisfactory into mild clipping, providing 100dBA into the standard load, and a modest 97dBA into the adverse load.

Lab results

Rated at 25W (14.5dBW), the amplifier specifi-

cations were cut a little fine, the amplifier just reaching 13.9dBW over the single-channel 8ohm power bandwidth. On the plus side, the level held up well on 4ohms continuous dual-channel duty. For the size, the peak current available was quite generous at ±9A. Into 8ohms, the peak output level reached 15.1dB, falling very little into 4ohms, and a reasonable 3.6dB into 2ohms; a pretty tolerant amplifier, this.

Both harmonic and intermodulation results were low and good signal-to-noise ratios were also demonstrated. The dc offset at the output terminal was satisfactory. Input overload margins were ample, while stereo channel separation was rather better than average, and channel balance and volume control tracking were in fact very good.

Disc input capacitance was on the high side at 260pF, though this is now quite a common feature. The other input characteristics were fine. The tone control responses were a little odd showing mild shelf cut, and stronger narrower boost at the frequency extremes. RIAA equalisation was essentially uniform, with a hint of treble lift above 10kHz, and no band-limiting or tailoring was evident.

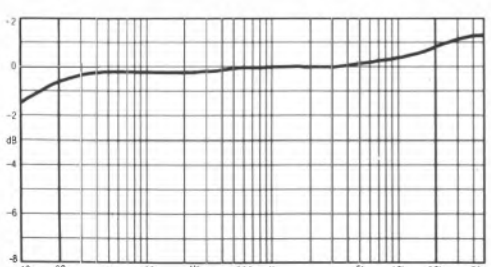
Conclusion

For 1986 we have concentrated on the *A320* which, with the tone controls omitted, superseded the original *A300*; sonically, it is a better value package. Reauditioned this year, the *'320* was slightly clearer as well as better focused, while the basic technical performance remains undisturbed. As a competent budget model, the *A320* comfortably attains recommendation.

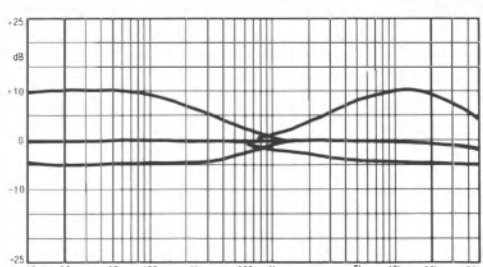
Test measurements

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.

GENERAL DATA	Integrated amplifier		
Power output			
Rated power into 8ohms, maker's spec	25W(=14dBW)		
Power output	20Hz	1kHz	20kHz
One channel, 8ohm load	14.3dBW	14.5dBW	13.9dBW
Both channels, 4ohm load	12.9dBW	13.2dBW	12.7dBW
One channel, 2ohms, pulsed	11.4dBW	11.7dBW	11.5dBW
Instantaneous peak current		+9A	−9.4A
Distortion			
Total harmonic distortion,	20Hz	1kHz	20kHz
at rated power, aux input	−82dB	−85dB	−73dB
Intermodulation, 19/20kHz, rated power, aux input			−73dB
Intermodulation, 19/20kHz, at 0dBW, disc (mm)			>−80dB
Noise			
Disc (mm) input (IHF, CCIR weighted)			−81dB
Aux/CD input (IHF, CCIR weighted)			−82dB
Residual, unweighted (volume control at min)			−75dB
DC output offset			24mV
Input overload	20Hz	1kHz	20kHz
Disc (mm) input (IHF)	32dB	31dB	31dB
Aux/CD input (IHF)	>20dB	>20dB	>20dB
Stereo separation			
Disc input	−69dB	−67dB	−53dB
Aux input	−72dB	−68dB	−53dB
Output impedance (damping)	0.06ohm	0.06ohm	0.12ohm
Channel balance, disc, at 1kHz			0.3dB
Volume/balance tracking	0dB	−20dB	−60dB
Aux input	0.3dB	0.6dB	0.1dB
Input data	socket type	sensitivity	loading
Disc (mm) input	Phono	0.44mV	46kohms, 260pF
Aux input	Phono	29.5mV	38kohms, 40pF
Disc equalisation error, 30Hz-15kHz			+0.5dB, −0.2dB
Size (width, height, depth)			44 x 30 x 10cm
Typical price inc VAT			£90



Disc input: RIAA equalisation accuracy



Tone control/filter responses

RAYLEIGH HI-FI

System details are as follows:

MISSION DAD 700R COMPACT DISC	£449.00
MISSION CYRUS 1 AMPLIFIER	£139.00
MISSION CYRUS TUNER	£199.00
MISSION 770F SPEAKERS	£379.00
TOTAL SYSTEM PRICE	£1,166.00

36 months at £46.00 (£10.62 per week)

RAYLEIGH HI-FI

44a High Street, Rayleigh, Essex

Tel: Rayleigh (0268) 779762

SUMMARY REVIEWS AMPLIFIERS

These brief reviews summarise our findings on models which have been fully tested previously but have been displaced from the main review section by the inevitable pressure on space. Note that despite this briefer coverage, many of the models here are still fully recommended.

A&R Cambridge A60 (£200)
This famous model remains a consistent performer which can be relied on to give competent results in many systems. It is fully equipped with inputs (mc via a circuit board change) and tone controls and mono switch. In the last edition, its subjective rating was about average, with some mid tonal hardness noted and a slightly reduced impression of life and stereo depth; despite further refinement since then, the *A60* is now somewhat overshadowed in value terms by the Arcam *Alpha* (see review) but is nonetheless a tried and tested design, well worth considering. (101.5/99dBA)

A&R Cambridge C200/SA200 (£280/£380)
With a rated output of 100W (20dBW), this pre/power combination offers comprehensive facilities including tone controls, a sound with satisfying dynamics and stereo depth, good technical performance and fine load tolerance, all at a realistic price. High sound levels of 105dBA are possible into a normal load. Well worth considering, the *C200/SA200* shows A&R's usual high standards of build quality. (105/104dBA)

Burmester 838/846 (£890/£890)
A slim, high-precision disc input device, the *838* may be used as a pre-amp if no other inputs are required; adding the *846* brings a superior line output stage as well as additional input facilities. The *838*'s strong points include extreme neutrality, dry clean bass and notably sharp stereo focusing. While not quite entering the territory of the best tubed devices such as the CJ *PV5*, the current *838* and *846* are very fine pieces of equipment, and are recommended.

Creek CAS4040 (£135)
With fairly basic features, the *4040* does offer tone controls and is specified as 35W per channel. It performed well on audition, giving fairly good stereo focus and depth and a lively effect, though bass was thought a touch 'lumpy'. Now joined by the newer *4140* (see full review), the *4040* is again recommended. (101/99dBA)

Denon PMA-717
Now officially discontinued, but possibly still available from some outlets, the 40W (16dBW) *'717* scored rather below average on the listening tests; bass was thought lumpy and poorly differentiated while the treble was grainy and sibilant, and fine detail rather muddled. Denon have done much better with the excellent *'707* (102.5/101dBA)

Hafler DH110/DH220 (£360/£445, kit £295/£380)
With good bass weight, extension and definition, this 115W (21dBW) combination gave a clear if slightly 'clinical' sound on disc (mm only) with even better results on CD, though it still lacked the final degree of transparency shown by reference models. Facilities include comprehensive inputs and tone controls. Build quality is good, while the kits are not hard to assemble and offer a saving. Worth considering. (106/105dBA)

Hitachi HA-6 (£250)
This 100W (20dBW) integrated amp is fully equipped with mm and mc disc inputs, tone controls and filters. With fine lab performance, it scored average on the listening tests, the bass a little 'soft' and the mid thin, and though the sound was fairly pleasant it was not sufficient for recommendation at the price. (105/103dBA)

Hitachi HCA8500/HMA8500 II (£556 complete)
Hitachi's flagship MosFet pre- and power 100W amp measured well on distortion, noise and so on, but showed poor power delivery into adverse loads. Sound quality was rated above average, but with a 'shut in' stereo effect. The sound deteriorated via the disc input however, and the combination could not be recommended. (104/100dBA)

Magnum P100/A100 (£950/£1995 pair)
The massive mono *A100* power amps can produce around 400W (26dBW) peak per channel into 8ohms, and scored well on audition, with powerful and tuneful bass, though a mild thinning in the midrange was noted, with a touch of treble 'grain'. The *P100* pre-amplifier, though improved since our full review, still not quite in the same class as the *A100*, which is recommended. (110/107dBA)

Marantz PM64 (£250)
With a rated power of 100W (20dBW), this large amplifier is well equipped with tone controls and input facilities. It showed restricted power delivery into difficult loads, but peak output was undoubtedly high at almost 200W (23dBW). Basically pleasant and inoffensive, its bass showed a boomy effect and lack of real definition. Its smooth nature did suit CD sources, but overall it scored below average on listening tests. (103/100dBA)

Musical Fidelity The Preamp (£299)
Now completely revised and with a handsome new fascia of grey anodised alloy. *The Preamp* now proves to be an exceptional product, which will win many friends. Due to last-minute changes we could not include it in the full review section.

SUMMARY REVIEWS AMPLIFIERS

Simple lever switching provides for tuner, CD and disc, with a rear mounted button for mm and mc options. Along with MF's new *P170* power amp (see full review), *The Preamp* can be fully recommended.

Musical Fidelity Synthesis (£389)
Based on the *Preamp* and the now deleted *Doctor T* power amp design, though with a smaller power supply, this 75W (18.5dBW) model proved to be a strong performer on the listening tests; it gave a plausible, coherent and focused sound, though with some loss of definition in low bass and extreme treble. Recommended in the last issue, it still rates as well worth considering despite the improved competition. (106/104.5dBA)

Musical Fidelity Studio T (£880)
The latest *Studio T* performed a little better than before though still with some 'glare' and 'grain' evident. It provides a generous, dependable power delivery, as proved in professional music service, and remains worth considering.

NAD 3020B (£139)
Nominally a 20W (14dBW) model, the long-serving *3020B*, with tone controls and some special features, still scored above average when last auditioned, with its slightly bloomed or 'rich' character found quite pleasant. The mc input lacked real 'see-through' clarity, and even with the more explicit-sounding mm input, bass was rated only average. With its healthy output (reaching 50W, 17dBW) and load tolerance, it is still recommended. (100/99dBA)

Naim NAIT (£225)
Naim's relatively inexpensive amplifier produced about 20W (13dBW) into 8ohms, holding up well into adverse loads down to 2ohms. Via disc (mm only) the balance was a trifle thin, but vocal detail was impressive with decent focus; bass was not perfect but seemed articulate. It was better still on auxiliary, detail and mid transparency still the strongest points. Facilities are minimal and our samples suffered switch-on thumps, but the *NAIT* remains a recommended model. (97.5/95.3dBA)

Naim NAP135 (£1644 pair)
Each mono *'135* power amplifier is essentially an uprated *NAP250* with the massive power supply feeding only one channel, giving nearly 100W peak with good load tolerance. The distinctive 'Naim sound' was there, slightly bandwidth-limited, with a highly precise up-front stereo image and dry character; it gave a feeling of confident, controlled authority. With application mainly to Linn/Naim systems, the *'135* is recommended. (103.5/102dBA)

Proton 520 (£99)
Roughly equivalent to the NAD *3020B*, this tone control-equipped 20W model is also made in Taiwan but differs greatly in construction. It offers both mc and mm disc inputs, and many other features including tone controls. Despite a touch of treble sibilance, tonal quality was pleasantly neutral, though it seemed softer with a loss of definition via auxiliary. Load tolerant and versatile, it continues to be recommended. (101/99dBA)

Nytech 202 (£155)
With a rewardingly above-average sound quality, Nytech's least expensive model is built to a good standard though, with quite complex circuit design and layout. Ergonomically styled with its sloped front panel, the *202* previously won a recommendation for its light, easy-on-the-ear sound quality with above-average depth, but now faces increased competition. Available to special order only. (98/96dBA).

PS Audio IVH/IIC (£645/£595)
This American pre-power combination comprises a pair of slim-built units, both with large outboard power supplies. The *IV* is a beautifully built pre-amp set to high standard, while the 50W (17dBW) power amp (of the two, the superior unit, in our view) was superbly load tolerant and despite a certain 'clinical' quality, the sound was open and transparent, with articulate bass, sharp stereo focus and good depth, and the combination is recommended — as can a cheaper version of the pre-amp, consisting of RIAA equaliser and passive control unit. (101.3/100dBA)

Robertson Forty Ten (£987)
A US-designed transistor power amp built in the Far East, the heavily-built *Forty Ten* is rated at 60W per channel. It set a high sonic standard, as transparent and dimensional as the very best semiconductor amplifiers, and a number of valve amps, with lively dynamics and a clean open character; it was good enough to show most of the merit of a pre-amp like the Audio Research *SP8*. Though slightly clinical in tonal balance, it also proved unfatiguing, and most satisfying over long listening sessions. Warmly recommended, many audiophiles need go no further. (103/102dBA)

Rotel RA820 (£110)
With tone controls and all the usual features, this 20W (13.5dBW) amplifier is the basis of the 'stripped' *'BX* version (see full review). It provides a musical-sounding immediacy, conveying depth, space and ambience, though the treble was a little bright; via auxiliary, it was even better, with impressive dynamics and clarity. Though not matching the sound of the *'BX*, the standard *'820* is still a Best Buy in its own right. (99/97dBA)

Rotel RA840BX (£180)
This bigger brother to the *'820BX* offers more

power (a rated 40W (16dBW) per channel) and an mc disc input facility, plus two tape inputs and a mono switch. Auditioned though not fully tested, it offered fine performance, retaining the virtues of the *'20*, and is also a Best Buy.

Rotel RC870/RB870 (£220/£220)

Rotel's pre-amp is clearly built with separate optimised buffer amplifiers for its mc and mm disc inputs, and uses fine quality components. It preserved good stereo depth, resolving rear detail well, and though tonally a touch 'lean', verging on the clinical, it gave a fine sound for the money. Surprisingly for the price, the 60W (18dBW) power amp is constructed as a double mono unit, and provided a likeable sound with good dynamics, though with some bass softness and touch of steel in the treble. Though overshadowed in value terms by the latest integrated *'870*, these units are recommended. (103/102dBA)

Sugden C128SL/P128 (£275/£450)

Sugden's slimline pre-amp showed further improvements this year and offers a pleasantly sweet tonal balance. Detail, stereo depth and precision were also good. Built as twin mono units with external heatsink fins, the power amp comfortably exceeded its 130W (21dB) rated output and went very loud, but it did show a lack of crispness and a slightly inarticulate exposition of transients and dynamics. While the *P128* is worth considering, the *C128SL* pre-amp is warmly recommended. (107dBA/104.5dBA)

Technics SU-V2X (£160)

Moderately priced and fully equipped with tone controls and a range of other facilities, this 45W (16.5dBW) model showed high peak current at +25A, but scored below average on sound quality with a busy, wispy, almost 'buzzy' tonality; dynamics appeared compressed and the sound lacked life and drive. (101/100dBA)

(Note: Figures in brackets at the end of each review are typical maximum sound levels with 8ohm and 4ohm loudspeaker loads. Since many models now have no tone controls, these are specifically mentioned when present.)

CONCLUSIONS AMPLIFIERS

With the test programme complete, it is possible to sum up the general findings of the project, as well as to give specific conclusions on current amplifier designs.

Competition in the amplifier field is hotting up and this edition proved particularly exciting. Many good models had noticeably improved since the last issue, when a few new entries already set a cracking pace. Hardly a single review rating from the previous edition has not been updated by reauditioning and revision, and in all we established 90 test sequences for the listening programme.

It is clear that in recent years, and certainly since the last issue, the buying public has become more discerning over their choice of amplifier. We considered it essential that the auditioning be conducted in such a way so as to produce solid, clear-cut ratings, obtained under conditions of low stress; that is, as naturally as possible. Small listening panels were found far more closely in tune with the product sounds than, for example, the larger assembly used during the 'double blind' behind the curtain tests for the auditioning of loudspeakers. We did crosscheck a number of the test amplifiers under controlled conditions, in order to verify the ratings obtained under the less formal conditions. Those who believe that most if not all, amplifiers sound the same, and that in any case any differences could only be shown under very stringent listening conditions, will probably part company with us here! My experience is that amplifiers *do* sound substantially different, that these differences are often not exposed or even hinted at in the results of lab tests, and that the audible differences can themselves vary quite considerably according to a number of factors.

Test conditions

Test conditions do play a part. For example, some models do not perform at their best when first switched on, and a warm-up period of some minutes is often desirable. This may be as short as five minutes duration with some, but much longer, even hours with models such as Mission *777*, Tandberg *3000* series and several others. This is because their output bias settings are adjusted for best operation when warm, and will not regain that adjustment until fully warmed up again.

Another factor is electrical matching, both in and out. For the latter, the ability to meet the demands of an awkward speaker load is important, depending on the type of speaker used. A 'kind' load may not expose the output weakness of some models. Conversely at the input, the disc stage is also important, whether moving-magnet and/or moving-coil. The first priority is for a decent match of sensitivity, noise level and overload margin to the chosen cartridge source. The overload problem is rarely encountered today, but there are exceptions, as the test results for the Creek, Nytech and to a lesser extent the Sondex, show. Insufficient sensititivity can spoil the signal-to-noise ratio; and listening test results are affected to a suprising degree by the presence of background noise, which can alter the perception of stereo depth and treble response balances.

Another factor is electrical load matching — is the amplifier's disc input resistance and capacitance considered ideal for the cartridge? Although with a good moving-coil cartridge, loading effects may be mild, the story is different for moving-magnet cartridges, where noticeable changes in treble balance and measured response occur with variations in total input resistance and capacitance. A number of amplifiers showed more than 200pF of mm disc input capacitance, which would be influential. For the purposes of the listening tests, a low-impedance cartridge was used which effectively moved this variable. Where CD was used as a signal source, its output (up to 2V rms) was sufficiently high to dictate rather low volume control settings. Where this was felt to have a possible bearing on the results, a 12dB RTJ attenuator was used in the CD signal lead to produce signal levels nearer normal, say 500mV.

Signal-to-noise and crosstalk

Interestingly very few of today's amplifiers can match the signal-to-noise ratio of the best CD players. The latter have been measured at 100dB, relative to full output for 1kHz ref CCIR/ARM weighting (better still with pre-emphasis.) The amplifier test results show figures in the 75-85dB range for a 1W output, IHF reference. Only if the figure for noise measurement was primarily due to power amplifier input noise could the quietest amplifier designs recover the full CD dynamic range in noise terms, at a 100W output (this being 20dB above the IHF level of 1W).

Now a group of MPs really worth listening to.

MP10 "Very much the 'baby' of the Nagoaka moving magnet range, the MP10 shares the same impressively rigid body structure".

"Separation figures rivalled many cartridges costing many times the price, even showing respectable control at high frequencies".

"The MP10 was very well liked for the 'seamlessness' and control of its sound, which showed remarkably good integration for such a low cost design".

"An obvious best buy."
HiFi Choice

MP10 £14.

Styli fully interchangeable for ease and economy of upgrading.

MP11 "In terms of sound quality, the MP11 stood out as the clear winner. Its ability to get the last degree of articulation and control from a bass guitar or synth line could make even the excellent C77 seem a little ponderous at times. Piano and synthesiser chord changes seem to be conveyed more precisely with the MP11, while vocals are open and backing vocals are very well separated and articulated ...It has all the detail and delicacy of the C77 with an added power and life that really help to convey a rhythm line."

"Superb sound. Excellent mounting quality. Nothing to criticise at the price."
What HiFi 12 cartridge supertest

With much improved quality control, the MP11 now offers a superb all round performance for the price."
What HiFi Awards 1985 Best cartridge under £50.

MP11 £19.

MP11 Boron "Low mass tips are often expensive to engineer and difficult to align". "Nagaoka have come up with a novel solution to reducing moving mass in the popular MP11 design".

"Nagaoka use a shanked diamond, where only the tip is made from diamond, but unlike other shanks which use diamond or a metal alloy this uses Boron. Boron has similar strength" properties to sapphire and yet it's nearly a third lighter than diamond."

"The sound quality improvement fully justifies the price difference on the new model. The MP11 Boron shows itself very capably in complex cymbal and percussion passages. It proved more capable of revealing the atmosphere of the recording acoustic".

"The audibly lower distortion of the MP11 Boron gives music a much more confident dynamic quality ...it can compete well out of its price category."
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CONCLUSIONS AMPLIFIERS

Historically, amplifiers have not needed a particularly high stereo separation and indeed even now the case for high separation is unproven in subjective terms. Nonetheless CD sources provide 80dB and more over the whole band, which makes the separation results achieved for a number of amplifiers via their auxiliary inputs look rather silly — some were as poor as 35dB at 20kHz.

Frequency responses

Most amplifiers' auxiliary inputs were sufficiently uniform in terms of frequency response for this factor to be ignored, and with a few exceptions this was also true of the disc inputs, whose main variation was due to the presence or absence of the IEC-recommended low-frequency rolloff. Even here, subjective evaluation of bass tonal balance, transient quality, tightness and so on rarely correlated with the low-frequency equalisation differences.

Amplifiers often showed differences in sound via each class of input — disc mm, discs mc, and aux/CD and each therefore needed careful subjective consideration. Where the pre-amp was itself in doubt an alternative was often substituted, to give the matching power amplifier every chance. Total judgement with these varying input results was necessarily complicated.

Amplifiers *do* matter. They affect the sound in a different way to other components, but because their influence may be less obvious, it does not necessarily follow that it is less important. The amplifier can often be the very component which influences the long term 'listenability' of a system.

Overall ratings

During the 12 months since the last issue of *Amplifiers* there has been a further improvement in the performance of the less expensive models on the market; so much so, in fact, that the established ratings of some well known models has been seriously disturbed.

So for some readers and even some manufacturers, this new issue's product ratings may come as something of a shock. Nevertheless, these listings have been drawn up with great care, and given the conditions of test, they should be more accurate than before, since judgements have been made with thorough cross-checking between products included for the first time in this issue and those that have been reassessed or completely retested this time. However, as with every edition of *Hi-Fi Choice*, judgement standards are to a great extent self-regulating, being determined by the overall standard of the product entry.

In a sense therefore this edition of *Choice* can be seen as presenting a two tier analysis; in the first place, it principally covers the broad market and seeks to provide helpful 'Best Buy' ratings up to a £275 price level. At higher price levels however the 'law of diminishing returns' applies to amplifiers as it does to other hi-fi items, and 'Best Buy' ratings become inappropriate. Instead, a 'recommendation' at the higher price levels indicates a fine performance where value considerations are of declining importance. With this in mind, we can 'recommend' a £1500 model providing that we considered its performance to be of sufficient merit.

Models are also recommended in the under £275 category, the rating here influenced by particularly favourable combinations of power, style, facilities and specific price of availability as well as sound quality. In some systems or circumstances, a 'Recommended' unit may suit better than one which is a 'Best Buy' in the same class.

Throughout the product group here tested there is a third category also listed, namely 'worth considering.' Here the product shows merit, but in the reviewer's opinion its strong points are unevenly spread, resulting in a less well-balanced performance.

The remainder of the amplifiers which receive no special comment, we considered to be below par on grounds of value and/or performance.

A brief word on the review criteria. Sound quality of course comes first, followed by a weighted mix of technical performance, build quality and ergonomics ('feel', ease of use, and style). Below the £275 price level, we have not attached too much importance to the provision for moving-coil cartridges but above this price level they assume increasing importance and the sound quality via this input plays a commensurately greater part in the value judgements.

Where pre- and power combinations are concerned, these are in the main assessed primarily as a combination, but where it was considered appropriate, separate ratings are also given. In the 'Best Buys' and 'Recommendations' listing, separates follow in a section after the integrated and combined results.

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BEST BUYS AND RECOMMENDATIONS
AMPLIFIERS

Here we have attempted to summarise the strong points of those models we have picked out as 'Best Buys'. 'Recommended' and 'Worth considering' in each price category, but please note that the full picture is only obtained by reading the reviews themselves.

Products which we have rated as 'Best Buys' are deemed to have shown themselves exceptional value for money in their price bracket, up to a maximum of £275. We feel that above this price level, sheer value for money is no longer so clearly definable or strictly relevant, and have accordingly restricted ourselves to 'Recommended' and 'Worth Considering' ratings on the £275-plus models. Products are listed under each heading in ascending order of price.

BEST BUYS: UNDER £100
Denon PM-A 707 £90
A tidy amplifier of good finish and well balanced performance, offering good value.

RECOMMENDED: UNDER £100
Yamaha A320 (£90)
Another well produced budget amplifier, the *A320* is a good all rounder, with simplified operating controls.

BEST BUYS: £100-£150
QED A230S (£109)
Further improvements have consolodated the strong position of this British amplifier, load tolerant and well made.
Rotel RA-820 (£110)
Still maintaining a competitive position, this amplifier is well equipped and continues to be excellent value.
NAD 3120 (£119)
Another no-frills design, this is a dependable performer with an above average power delivery.
Rotel RA820BX (£140)
A 'turbo' version of the *820* the frills are omitted and the sound notably improves.
Mission Cyrus One (£140)
In this issue, the *One* sets a very high standard at the price. Moving-coil inputs are included in this unusual design.
QED A240-CD (£149)
Just qualifying for this price category, the *240* is an advanced *A230* with a performance to match the price.

RECOMMENDED: £100-£150
A&R Alpha (£130)
A welcome newcomer, this amplifier is well styled and engineered, with a good all round performance. Tone controls are included on this fully equipped model.
Creek CAS 4040 (£135)
This lively amplifier carries a continued recommendation.
NAD 3020B (£139)
The classic NAD amplifier is holding up well in this current version.

BEST BUYS: £150-£200
AR integrated amplifier (£175)
Improved for 1986, this amplifier continues its strong competitive performance.
Sansui AUG 30X (£179)
Appreciative at last of the high standards set by UK integrated amplifiers, this solid newcomer has hit the big time, entering Best Buy territory.
Rotel RA840BX (£180)
Auditioned, but not fully reviewed this time, this larger version of the *820* is a high value powerhouse with marginally reduced subtlety.

RECOMMENDED: £150-£200
Harmon Kardon PM645 (£159)
This highly competent model is very load tolerant and comes both well equipped and finished.
BEST BUY: £200-£275
Mission Cyrus Two(£260)
An undoubted class leader this model gets better and better. Offering high quality stereo and great definition, it will not disgrace even quite costly audio systems.

RECOMMENDED: £200-£275
Musical Fidelity A1 (£210)
Although offering a small power rating, this elegant, pure Class A design makes up for it with a sweet musical sound, well deserving of recommendation.
Naim Nait (£224)
By now well established, this modest but well made integrated amplifier is worthy of continuing recommendation due to its lively, musical performance.
Proton 540 £240)
Of generally good sound and with comprehensive features and facilities, the main claim to fame for this slimline amplifier is its massive programme power delivery — an astonishing 350W per channel.
Myst TMA3 (£250)
With recently improved cosmetics, this finely made British amplifier is a neat exposition of the minimalist approach.

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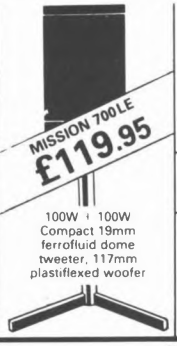

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BEST BUYS AND RECOMMENDATIONS
AMPLIFIERS

RECOMMENDED: OVER £275 (INTEGRATED)
A few worthy examples are available in this category, generally offering 50-100W.
Rotel RA-870 (£285)
Essentially in the *820BX* class, the higher price brings near effortless dynamic range with over 100W programme per channel.
Audiolab 8000A (£299)
Now established as a British classic, this fully featured design continues to hold its own in a competitive market.
Mission Cyrus Two with PSX (£460)
The PSX upgrade moves the *Cyrus Two* into a rather higher class, more than justifying the price lift and edging into the audiophile class.

INTEGRATED AMPLIFIERS
WORTH CONSIDERING
AR A60 (£200)
Highly versatile with a long established record, recent improvements have kept it in the running.
Meridian MCA-1 (£440 upwards)
Costly for its power rating, current versions are nonetheless maintaining good sound quality. In pre-amp only form, *(MLP-1)* it is recommended.
Musical Fidelity Synthesis (£389)
Overshadowed this year by the new *A1*, the *Synthesis* remains a fine integrated example with an exceptional power delivery into 8ohm loads.

RECOMMENDED: SEPARATES
Recommended pre-amplifiers and power amplifiers are given here in ascending price order. See text for details of performance and matching considerations. In the listing 'M' denotes a product felt to be of additional special merit. The list also includes some models which for one reason or another could not be fully reviewed, but were auditioned — these are marked 'audition'.

PRE-AMPLIFIERS
Croft Micro (£150)
Meridian MLP-1 (£240 upwards)
Audiolab 8000C (£275)
Sugden C128 SL (£275)
Musical Fidelity (The Preamp) (£299)
DNM Primus (£450) and Twin (£1233)
Le Tube (+PrePreHeadAmp) (£480, £385)
PS Audio IVH (£645)
Counterpoint SA7 (£777)
DNM 2A (£820)
Musical Fidelity MVT (£800) M
Counterpoint SA3-1 (£1286)
DNM Series III (£1400)
Naim NAC32 (Hi-Cap)
Krell PAM 5 (£1500)
Burmester 838/846 (£1600 pair)
Conrad Johnson PV5 (£1875) M
Audio Research SP8 II (£1998) M
Conrad Johnson Premier 3 (£3400 audition) M
Audio Research SP10 II (£3997) M

POWER AMPLIFIERS
Rotel RB 870 (£220)
Audiolab 8000P (£450)
Musical Fidelity P170 (£460)
PS Audio IIC+ (£595)
Beard P35 (£700)
Linn LK2 (with Pre-amp £750)
Naim NAP 250 (£822)
Robertson Forty Ten (£987)
Tannoy SR840(£1060)
Counterpoint SA12 (£1300)
Conrad Johnson MV50 (£1540) M
Quicksilver Mono (£1550 pair) M
Naim NAP 135 (£1644, pair)
Magnum A100 (£1950)
Krell KSA50 (£2190)
Audio Research D70 II (£2190)
Audio Research D115 II (3337, audition) M
Krell KSA 100 (£3400, audition) M
Conrad Johnson Premier 4 (£3600, audition) M
Burmester 828 (£4600, audition) M
Audio Research D250 II (£6850), audition) M

SEPARATES WORTH CONSIDERING
The following products are worthy contenders, while not reaching a sufficient sonic standard or value rating to merit outright recommendation here.

PRE-AMPLIFIERS
Hafler DH110 (£360, kit £295)
Quad 34 (£249)
Quad 44 (£359 audition)
Meridian Component Series (from £440)
Linn LK1 (£750 complete)
Linx Stratos (with poweramp £1400)
Tandberg 3008A (£564)
Magnum P100 (£950)
Mark Levinson ML10A (£2900, audition)
Burmester 838/846 (£890/£890)

POWER AMPLIFIERS
NAD 2200 (£340)
Hafler DH120 (£360)
Hafler DH220 (£440, kit form £380)
Sugden P128 (£450, pair)
Tandberg 3006A (£717)
Musical Fidelity Studio T (£880)
Mentmore M100 (£1140 per pair)
Linx Stratos (with preamp £1400)

COMPARISON CHART AMPLIFIERS

	Power output Continuous power, 8ohms, one channel		Peak Power			Disc input Moving-magnet		Moving-coil		CD/Tape/Aux input	
			8ohms	4ohms	2ohms	noise, CCIR/ ARM	RIAA response 30Hz-50kHz	sensitivity	noise	sensitivity	noise IHF
	watts (spec)	dBW (test)	dBW	dBW	dBW	– dB		μV	– dB		– dB
A&R Arcam Alpha	30W	16.2	17	15.5	14.6	– 73	+ 0, – 1.5dB	—	—	36mV	– 77
A&R A60 Improved*	35W	16.5	17.5	16	7.7	– 78	+ 0, – 2.4dB	17.2μV	– 72	18.7mV	– 84
Akai AM-A90	130W	22	23	21.5	20	– 66.6	+ 0.43, – 0.83dB	30μV	– 65	13mV	– 67.4
Audio Research SP8/D70	65W	18.5	19.5	16	8	– 75	±0.1dB	(see mm)		28mV	– 78
Audiolab 8000A	50W	19.0	19.8	18.6	18	– 78	±0.3dB	7.5μV	– 73	12mV	– 82
Audiolab 8000C/8000P	100W	21.5	22	21	20.3	– 70	+ 0, – 2dB	7.5μV	– 82	15mV	– 70
Beard P35 (power)	35W	16.5	17.5	16	12.4	—	—	—	—	—	—
Conrad Johnson PV5/MV50	50W	18.1	19	16	14.5	– 62	+ 0.43, – 0.1dB	41μV	– 53	5.2mV	– 68
Counterpoint SA7 II/SA12	100W	22.7	24	23.5	23	– 72	+ 0.1, – 0.3dB	17μV	– 58	31mV	– 74
Creek CAS4040	35W	15.5	16.5	15	12	– 74	+ 1.4, – 0.5dB	—	—	70mV	– 75
Creek CAS4140	35W	15.5	16.5	14.5	13.8	– 68.5	+ 0.04, – 0.9dB	—	—	70mV	– 72
Croft Micro (pre)		pre-amplifier				– 74	+ 0.26, – 0.16dB	see mm		50mV	– 92
Deltec (pre)		pre-amplifier				—	+ 0, – 0.75dB	700μV	– 72	700mV	– 85
Denon PMA-707	25W	17	17.5	15	13.1	—	+ 0, – 0.4dB	—	—	32.5mV	– 77
DNM Series 3 (pre)		pre-amplifier*				—	+ 0, – 1.8dB	100μV	– 64	85mV	– 88
Hafler DH120 (power)	60W	17.5	18.5	17.3	16	—	—	—	—	—	—
Harman Kardon PM645	40W	18	19.5	19.2	19	– 72	+ 0.87, – 0.3dB	—	—	21mV	– 74
Hitachi HA-3	50W	21.1	22	19	17.2	– 76	+ 0, – 0.7dB	—	—	20mV	– 78
JVC A-GX1	30W	16.4	17	15.5	14	– 66	+ 0, – 0.44dB	—	—	27mV	– 80
Krell PAMS/KSA 50	50W	19.1	19.3	19	18	—	+ 0.3, – 0.5dB	see text		136mV	– 88
Le Tube/Prepre (pre/mc)	—	—	—	—	—	– 70.2	+ 0.12, – 0.75dB	see text		145mV	– 80
Linn LK1/LK2	60W	18.6	19.2	19	18.8	– 76	+ 0.13, – 1.4dB	53μV	– 71.3	133mV	– 80
Linx Stratos (pre/power)	120W	21.3	23.5	23	22.8	– 57.7	+ 0.16, – 1.93dB	15μV	– 57	10mV	– 58
Lux LV105	85W	21.7	22.5	20	18	– 71	+ 0, – 0.83dB	15μV	– 67	16mV	– 76
Magnum IA125	50W	17.7	18	17.2	16	– 67	+ 0, – 0.75dB	20μV	– 65	20mV	– 67
Marantz PM-84	120W	22.9	23.5	21	15.5	– 71.2	+ 0, – 0.95dB	24μV	– 68	15mV	– 72.4
Memmore M100 (power)	100W	20.8	21.5	17.8	16.4	—	—	—	—	—	—
Mission Cyrus One	25W	16	17.2	16	12.5	– 72	+ 0, – 1.6B	41μV	– 58	68mV	– 77
Mission Cyrus Two/PSX	50W	17.7	18.5	16.9	15.4	– 76	+ 0, – 1dB	23μV	– 69	60mV	– 80
Musical Fidelity A1	20W	13.7	14	10	8.3	– 70	+ 0, – 2.75dB	40μV	– 67	23mV	– 83
Musical Fidelity MVT/P170	85W	21	21.5	19.8	14.8	– 78	+ 0, – 0.34dB	90μV	– 73	89mV	– 93
Myst TMA3*											
NAD 3120	20W	17.2	17.6	16	14.8	– 80	+ 0.1, – 0.4dB	38μV	– 73	28mV	– 80
NAD 2200 (power)	100W	22.9	27	26	25.5	—	—	—	—	—	—
Naim NAC32/NAP250*	70W	19	19	18.6	16.5	– 79	+ 0, – 0.7dB	10μV	– 72	10.3mV	– 80
Onkyo Integra A-8057	100W	20.2	21.8	21.3	20.7	– 70	+ 0, – 1dB	20μV	– 67.6	20mV	– 72
Perreaux SA3/1850	180W	24.7	25.5	24	22.5	– 82	+ 0, – 0.9dB	20μV	– 82	25mV	– 72
Pioneer A-77X	100W	21	22.5	21.5	20.0	—	+ 0.1, – 0.1dB	20μV	—	15mV	—
Proton 540	40W	18.4	24.5	24	23.5	– 76.6	+ 0.05, – 0.95dB	16μV	– 69	25mV	– 80
QED A230S	30W	16	16.5	15.2	12.5	– 67	+ 0, – 1dB	—	—	40mV	– 72
QED A240-CD	40W	17.3	18	16.8	15.5	– 72	+ 0.02, – 0.85dB	—	—	60mV	– 70
Quad 34/405	100W	20.3	21	19.6	13.2	– 80	+ 0, – 0.35dB	13μV	– 74	11.3mV	– 81
Quicksilver (power)	60W	17.6	18.5	17	15	—	—	—	—	—	—
Robertson Forty Ten	60W	19	19.5	19	18	—	—	—	—	—	—
Rotel RA820BX	25W	15.8	16.5	15.8	14.5	– 74	+ 0, – 0.6dB	—	—	—	– 82
Rotel RA-870	60W	19.2	22	21.4	20.3	– 75	+ 0, – 1dB	48μV	– 63	22mV	– 78.6
Sansui AU-G30X	45W	18.3	19	18.3	17.5	– 72	+ 0.1, – 1.9dB	—	—	27mV	– 73
Sondex Amadeus	35W	16.1	17	see text		– 75.5	+ 0.4, – 1.3dB	130μV	– 69.5	325mV	– 78.8
Sony TA-AX320	55W	18.7	19.7	18.8	15.6	– 68	+ 0.3, – 0.14dB	—	—	16mV	– 72
Sugden A25	25W	15.4	16.5	16	15.1	– 74	+ 0, – 1dB	—	—	45mV	– 78
Tannoy SR840 (power)	250W	25.2	27.5	26.9	26.4	—	—	—	—	—	—
Technics SU-VIX	40W	18.1	19	18.7	18.0	– 65	+ 0.08, – 0.16dB	—	—	27.3mV	– 67
Trio KA-54B	55W	17.5	18.5	17.8	17.1	– 69.2	+ 0, – 0.4dB	—	—	24mV	– 72.4
Yamaha A320	25W	13.9			11.7	– 81	+ 0.5, – 0.2dB	—	—	29.5mV	– 82

Important: models first tested last year are not necessarily listed here — see reviews

COMPARISON CHART
AMPLIFIERS

Maximum subjective sound level		Stereo qualities		Midband tonal balance	Musical detail	Bass precision	Treble quality	General sound quality via aux input/ power amp direct	Typical price/ rating		
8ohm load	4ohm load	stereo depth and ambience quality	stereo focus and precision								
dBA	dBA										
101	98	average +	good	neutral	average +	average +	average +	good	£130	R	A&R Arcam Alpha
101.5	99	average	good	sl. hard	good	average +	good	average +	£200	W	A&R A60 Improved
105	103	average –	average –	sl. thin	good	average –	average	average –	£400	—	Akai AM-A90
103	100.5	excellent	v. good +	neutral	excellent	v. good	v. good	v. good	£1998/£2190	R/R	Audio Research SP8/D70
103	102	good +	v. good	sl. clinical	v. good	good +	good	good +	£295	R	Audiolab 8000A
105	104	good +	v. good	sl. clinical	v. good	v. good	v. good	v. good	£275/£450	R/R	Audiolab 8000C/8000P
102	99	v. good +	v. good	neutral	v. good	v. good	v. good	v. good +	£695	R	Beard P35
105	102.5	excellent	v. good	neutral	excellent	v. good	v. good +	v. good +	£1875/£1540	R/R	Conrad Johnson PV5/MV50
107	105	v. good	v. good	sl. thin	v. good	v. good	good +	v. good	£770/£1300	R/R	Counterpoint SA7 II/SA12
101	99	average +	average +	sl. thin	average +	average	average +	average +	£135	R	Creek CAS4040
101	99	average +	average +	uneven	average	average +	average +	average +	£165	W	Creek CAS4140
—	—	v. good	v. good	sl. bright	v. good	v. good	good +	v. good	£150	R	Croft Micro
—	—	v. good	v. good	sl. rich	good +	good +	good	good +	£666	W	Deltec
102	100	average	average	f. neutral	average +	average +	average	average	£90	B	Denon PMA-707
—	—	v. good	v. good	neutral	v. good	v. good	v. good	v. good	£450-£1400	R	DNM Series 3
102	101	average +	good	sl. glare	good	good	good +	good +	£360 £295‡	W	Hafler DH120
104	103	good	good	neutral	average +	average +	average +	good	£159	R	Harman Kardon PM645
105	102	poor	average –	glare	average	poor	poor	poor	£180	—	Hitachi HA-3
100	97	poor	average –	average	average –	average –	average –	average –	£70	W	JVC A-GX1
103	102	excellent	v. good +	neutral	v. good	excellent	v. good	v. good +	£1500/£2190	R/R	Krell PAM5/KSA 50
—	—	v. good	v. good	neutral	v. good	good	v. good +	v. good	£480/£385	R/R	Le Tube/Prepre
103.5	103	good +	v. good	neutral	v. good	good +	v. good	good + +	£750 (set)	W/R	Linn LK1/LK2
108	107	v. good	good +	sl. hard	good +	v. good	v. good	v. good	£1400 (set)	W	Linx Stratos
106	103	good +	good	f. good	average +	good	average +	good	£495	—	Lux LV105
101.5	100	good	good +	sl. brash	good +	good +	good	good	£420	—	Magnum IA125
106	103	average +	good	good	good	good	average +	good	£400	—	Marantz PM-84
106	104	v. good +	good +	sl. thick	good +	good	good +	good + +	£1140 (pair)	—	Mentmore M100
102	100.5	v. good	good +	f. neutral	good +	good +	good +	good +	£140	B	Mission Cyrus One
103	101.5	v. good	v. good	sl. thin	v. good	v. good	v. good	v. good	£260 £460	B(R)	Mission Cyrus Two/PSX
99	96	good +	good +	good +	good + +	good	v. good	good +	£209	R	Musical Fidelity A1
105	102.5	v. good	v. good	neutral	v. good	good +	v. good	good +	£800/£460	R/R	Musical Fidelity MVT/P170
									£250	R	Myst TMA3
102	99.5	good	good	sl. hard	good +	good	average +	good	£119	B	NAD 3120
111	109	average +	good	lean	good	good	good	good +	£339	W	NAD 2200
103	101	good +	v. good	sl. hard	v. good	v. good	v. good	v. good	£368/£822	R/R	Naim NAC32/NAP250
105	104	average	average +	average	average +	average +	average	average +	£200	W	Onkyo Integra A-8057
109	107	good	good +	good	good	good	good	good	£690/£990	—	Perreaux SA3/1850
105.5	104	average –	average –	rough	average	average –	poor	poor*	£370	—	Pioneer A-77X
108	107	good	good	sl. hard	good	good +	good	good	£239	R	Proton 540
100	98.5	average +	average +	sl. hard	good	average	average	good	£109	B	QED A230S
100	99	good +	good	sl. thin	good +	good +	average +	good +	£149	B	QED A240-CD
105	104	average	average	neutral	average +	average	average +	average +	£249/£289	W	Quad 34/405
102	100	excellent	v. good +	neutral	excellent	v. good +	excellent	excellent	£1550 (pair)	R	Quicksilver
103	102	very good +	excellent	sl. lean	v. good +	excellent	v. good	v. good +	£987	R	Robertson Forty Ten
101.5	100.5	v. good	good +	sl. light	v. good	good +	good +	good +	£140	B	Rotel RA-820BX
106	105	good +	good +	good +	v. good	good +	good +	good + +	£285	R	Rotel RA-870
103	102	good + +	good +	neutral	good +	v. good	good +	good +	£179	B	Sansui AU-G30X
101	n/a	good +	good	good	good +	average +	good	good	£195	R*	Sondax Amadeus
103	101	poor	average –	thin/hard	average	average –	average –	average –	£120	—	Sony TA-AX320
101	100	poor	average –	dull	poor	poor	average –	poor	£150	—	Sugden A25
111	110	good + +	v. good	sl. clinical	good + +	v. good +	good +	v. good	£1093	R	Tannoy SR840
102	101	average –	average	bright	average +	poor	average –	average –	£144	—	Technics SU-VIX
102	101	poor	average –	muddled	poor	average –	average –	poor	£99	—	Trio KA-54B
100	97	average +	average +	sl. hard	average +	average +	average +	average +	£90	R	Yamaha A320

**see text ‡ in kit form*

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TECHNICAL INTRODUCTION
TUNERS

All the tuners included in the test programme were subjected to laboratory analysis as well as listening tests to determine sound quality under various reception conditions.

Tests were carried out on a group of tuners which are the logical partners of a number of the amplifiers covered in this book. All were examined carefully in the laboratory and given thorough subjective tests, even though the reporting of these results is somewhat brief.

Listening tests

For the auditioning, the tuners were tried on a variety of local and regional stations at the author's North London address. Critical tests included the use of a studio quality stereo encoder and low distortion transmitter/generator, fed with master-quality digital PCM programme material. The degradation imparted by the tuners was assessed on a before-and-after transmission basis. In addition, the low-signal radio frequency and quieting performances were subjectively assessed, particularly with respect to the odd whistles which are still to be found on some digitally synthesised tuners. Stereo signal-to-noise was also assessed.

Laboratory testing

Lab testing included a number of distortion measurements, for example, at 100% modulation depth, 1kHz, with the results for both mono and stereo working. Response to overmodulation was subjectively assessed on programme as well as by a 130% modulated 1kHz tone, with distortion readings here in mono. Distortion was also assessed via a Curtis-designed test whereby one channel is fed 1kHz, and the other 5kHz, with the resulting crosstalk and dynamic intermodulation products analysed.

Output level quoted is for full modulation, those tuners producing over 700mV being potentially suited to direct connection to some of the more sensitive power amplifiers, such as Mission or Quad.

Muting levels were noted, these the signal strengths below which the designer considers that noise is excessive and the tuner output is therefore automatically muted.

AM rejection is a measurement allied to capture ratio, these seeking to quantify how powerfully the tuner can reject co-channel interference, multipath reflections, ignition and impulse breakthrough, unwanted radio signals from other transmitters or a weaker FM signal very close to the wanted one. Capture ratios of lower than 1.3dB are pretty good, the range generally between 0.6 to 3.0dB, the latter upper limit being regarded as poor. AM rejection ratios go from 50 to 80dB, the former an adequate result, the latter an excellent one.

Pilot tone rejection is the supression of unwanted stereo tones at 19 and 38kHz, which for most people are inaudible, but they nonetheless can disturb tape recordings. Better than 55dB is considered to be good for here.

Ultimate signal-to-noise ratios (CCIR ARM weighted with a 1kHz reference) for mono and stereo are also given, the latter rather more relevant. Some tuners do add a degree of audible hiss to broadcasts. Stereo separation is measured from 1 to 10kHz, with figures of 45dB, and 35dB, 10kHz considered pretty good.

Alternate channel selectivity quantifies how well the tuner can receive a weak distant transmission spaced closely on the dial to a strong station. Here 60dB is considered a good practical standard, with 80dB as very good.

Graphs of limiting and quieting were produced, these measured versus signal strength, the former showing how quickly the output level stabilises and the latter how quickly the noise level improves to a good subjective value. These determine how clean the tuner will sound on weaker stations, or in fringe areas where the signal strength is low.

Finally, the frequency responses were measured, these charted from a low 10Hz to 20kHz; but most had pretty flat responses, which were therefore considered unlikely to be a major influence in the auditioning results.

Aerial considerations

FM reception conditions can vary considerably with quite small differences in district, address or local geography and buildings. When purchasing a tuner for use in a difficult area, it is worth having an arrangement with a dealer to return those models that prove unsatisfactory at your location. We cannot also stress too strongly the need for a good, preferably roof-mounted aerial for FM if a hi-fi performance is to be achieved from a good tuner — a poor or badly sited aerial with multipath effects can produce a constant 10-15% distortion on peak modulation. Fitting an aerial, if required, must therefore be included in the real cost of a tuner, and may influence or dictate the purchase of a cheaper or a more expensive model.

REVISED AND REPRINTED

Akai AT-A2L

Akai (UK) Ltd, Unit 12, Haslemere Heathrow Estate, Silver Jubilee Way, Hounslow, Middlesex
Tel 01-897 6388

This lightly-constructed slimline tuner is finished in satin silver with a contrasting grey panel area. A synthesiser design, it has pushbutton auto-seek tuning plus a set of pre-set buttons that allow up to 16 stations to be memorised. It covers long, medium and VHF/FM wavebands.

All the controls are pushbutton and the stereo auto muting mode can be cancelled to allow reception of weak mono stations. As is now common with recent low cost designs, the specifications were pretty good, and were more or less guaranteed by the stack of standard tuner ICs used inside. Unless used in the matching Akai rack the *A2L*'s fixed output cable, rather short at only 0.3m, may prove a minor nuisance.

Sound quality

Rated below average, this tuner sounded weak on low frequencies with a thinned almost scratchy upper mid-treble register. Vocals were both pinched and hard sounding. It did prove sensitive with rapid quieting, but stereo hiss levels were just average.

On AM the sound was positively disliked and in our opinion was worse than many a portable radio.

Lab results

Sensitivity was satisfactory with signals above 500μV providing good stereo signal to noise ratios. The 60dB (CCIR ARM) noise figure was unexceptional improving to 68dB in mono. Selectivity was reasonable at 55dB while the pilot tone spurii were well suppressed. Channel balance was very good, while the frequency response was most uniform; for example within 0.15dB at 10kHz. Stereo separation was very good, and the measured harmonic distortion levels were most reasonable. The RF performance was good for the price, while both AM suppression and capture ratio were fine. The front end also demonstrated a good overload performance.

Conclusion

Basically a good tuner in measurement terms, this Akai did however have poorer noise levels than usual. In addition, sound quality was judged to be disappointing, on FM and particularly on AM. No recommendation is appropriate here but it does have the merit of low cost.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	3.5μV/40μV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	68dB/60dB
Muting threshold	25μV
Alternate channel selectivity	55dB
Pilot tone rejection, 19kHz/38kHz	65dB/72dB
AM rejection	60dB
Capture ratio	1.4dB
Total harmonic distortion	
at 100% mod, 1kHz mono/stereo	– 56dB/ – 57dB
Stereo separation, 1kHz/5kHz/10kHz	60dB/49dB/45dB
Output level, 100% mod	741mV
Channel balance	0.02dB
Dimensions (width, depth, height)	44 x 25 x 7cm
Typical price inc VAT	£60

RECOMMENDED

Denon TU-717

Hayden Laboratories, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG
Tel (0753) 888447

Modestly priced, this tuner still claims a substantially good performance according to the manufacturer's specifications.

A straightforward, manually tuned slide-rule dial model, the *717* is designed to match the *707* amplifier at a similar selling price. The *717* covers three UK wavebands, MW, LW and FM, but as its design indicates, no preset tuning is possible. Facilities include mono/stereo muting, a limited resolution signal strength indicator plus a tuning indicator lamp, with dial position shown by a moving 'led'. The audio output is via a short captive cable with phono plugs attached.

Sound quality

Scoring just 'average' on sound quality, the audio performance showed a lack of stereo width and focus precision, with some untidiness in the treble definition. Modest depth was heard and the result was fairly musical. At the price level, this is a decent performance. However, on AM the sound was poor, with a rough distorted effect, and showing a sharp coloration; Intelligibility was satisfactory on speech.

Lab results

Proving to be one of the better performers in the lab, the *717* returned a fine 25μV stereo sensitivity, backed by whistle-free reception and a good ultimate signal to noise ratio; this using the tough 'CCIR ARM' reading method with a 1kHz reference level. Alternate channel selectivity was a fine 74dB which in conjunction with good results for capture ratio and AM suppression, indicated a powerful RF performance suited to a wide range of reception conditions. Channel separation was satisfactory while distortion verged on 'good'. The pilot tones were nicely rejected and a close channel balance was maintained. Output for full modulation was nearly 0.5V, a typical result. For frequency response, the output was well maintained over from 10Hz to 10kHz (at −0.5dB), falling more quickly to −3dB at 16kHz. The AM rejection was found to vary with signal level over quite a wide range; for example, 50dB at 40μV and 70dB at 2mV inputs, the latter a remarkable result. Overall the technical performance was pretty good.

Conclusion

The radio frequency performance was good enough for the price, while the stereo sound quality was satisfactory. The AM sound was thought rather unpleasant, but overall, this tuner was powerful enough in radio performance terms to merit a recommendation.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	2.5μV/25μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−74.5dB/−66.0dB
Muting threshold	approx 10μV
Alternate channel selectivity	−74dB
Pilot tone rejection, 19kHz/38kHz	−64.2dB/−105.5dB
AM rejection	−56dB
Capture ratio	2dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−47dB/−45dB
Stereo separation, 1kHz/5kHz/10kHz	−27dB/−28dB/−30dB
Output level, 100% modulation	454mV
Channel balance, stereo	0.15dB
Dimension (width, height, depth)	43.5 x 7 x 30cm
Typical price Inc VAT	£90

Harman Kardon TU915

Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD
Tel (0753) 76911

This upmarket design is tastefully finished in pale gold, a nice change from the ubiquitous satin black. Cleanly styled, the front panel sports several facilities, including eight preset buttons, valid for all three wavebands — long and medium-wave AM and VHF/FM. The muting level is continuously variable, while 'high blend' is available to reduce the noise on weak stereo transmissions. Stereo/mono mode selection is independent of interstation noise muting. This tuner also has a digital display, yet like the Naim, it offers well-loaded spin-wheel tuning. Five LEDs indicate signal strength, while both variable and fixed audio outputs are provided.

Inside, the unit is quite sophisticated and the flywheel tuning is revealed as an optical shaft encoder, feeding the all-digital synthesiser circuitry. Manual and auto-seek tuning circuitry is present, with special care taken to maximise audio quality.

Sound quality

This tuner gave a good performance on FM but liked a healthy signal if minor but audible whistles were to be fully suppressed. Bass was quite solid and extended, the mid open and clear with realistic stereo depth, width and focus. In absolute terms it was touch 'forward' with a degree of treble 'slurring'. On AM it was thought wretched, sounding 'tinny' and scratchy, a really unpleasant sound.

Lab results

The presence of audible whistles prejudiced the 50dB sensitivity in stereo, which was unexceptional at 80μV. Likewise, the ultimate stereo signal to noise ratio in stereo was just average at 60dB. The pilot tone rejection was fine while the alternate channel selectivity was very good. AM rejection was also very good, while capture ratio was just average. The total harmonic distortion held to 0.25% at full modulation in stereo while channel separation was also good, nearing 50dB midband. On frequency response, the bass was very well extended while the treble rolled off a little, to, for example, −1.3dB by 10kHz. Front end overload margins were very good.

Conclusion

With a promisingly good FM sound quality, this tuner was marred by a digitally-related breakthrough into the audio at modest aerial signal levels. On AM the sound quality was a huge contrast and rated as 'poor', which was disappointing for a model in this price class. Nonetheless, it rates as worth considering.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	7.5μV/80μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−74dB/−59dB
Muting threshold, R.F. level	18μV
Alternate channel selectivity	−78dB
Pilot tone rejection, 19kHz/38kHz	−41dB/−100dB
AM rejection	66dB
Capture ratio	2.8dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−54dB/−51dB
Stereo separation, 1kHz/5kHz/10kHz	−46dB/−47dB/−44dB
Output level, 100% modulation	855mV
Channel balance, stereo	0.20dB
Dimension (width, height, depth)	44 x 7 x 36cm
Typical price inc VAT	£249

RECOMMENDED

Hitachi FT-5500 Mk 2

Hitachi Sales (UK) Ltd, Hitachi House, Station Road, Hayes, Middlesex UB3 4DR
Tel 01-848 8787

Another well established design, the *5500* is now available in 'Mk II' form, still competitively priced. It proved rather complicated to measure since its various modes effectively result in four sets of tuner results! These have been sensibly simplified in the table. A field condition computer system ('FCCS') can select various modes according to reception conditions, automatically assuring optimum sound quality and noise suppression. Medium wave AM and VHF/FM coverage are offered, but long wave has been omitted. Sixteen presets are available, with auto-seek and manual tuning facilities; in addition, an RF attenuator plus narrow and wide IF options may be selected.

Sound quality

The overall sound was highly rated on FM, with a very low-noise background in stereo, fine instrumental detail plus clarity, together with well focused, wide stereo images. Bass was good, the mid was tonally a touch thin, and the treble pretty clean. Stereo depth was unexceptional. On the narrow IF setting the image quality was degraded, together with a loss of detail.

On AM the sound was basically satisfactory.

Lab results

Previously the *5500* could overload on strong RF signals, but now the switchable RF attenuator has provided a solution. Good sensitivity was shown (10dB worse with the RF attenuator), and although the signal to noise ratios were very good, the muting threshold was set too low for my taste at around 7μV. On 'wide', the alternate channel selectivity was acceptable indeed better than usual at 29dB, and when required, the narrow IF gave a fine 74dB of rejection. The multiplex pilot tones were excellently rejected. The capture ratio results varies with the different modes, from an excellent 'narrow band/single' result, to 4dB on 'wide/double'. AM rejection remained pretty constant at around 60dB. On the best settings the total harmonic distortion was around 0.5% in stereo, worsening to 1% on 'narrow/double'.

Frequency response was rather 'tailored' with 1.8dB of bass lift by 80Hz, and the same degree of cut at 10kHz; it was 3dB down by 13.5kHz.

Conclusion

In its latest form the *5500 II* showed a versatile all round performance, both on the RF and the audio front, though some initial learning will be needed to obtain best results. Recommended.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	5μV/55μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	for all settings, 80dB/69dB
Muting threshold	single, wide IF, 7μV (narrow 6μV); double wide 17μV (narrow 15μV)
Alternate channel selectivity	29dB (narrow 74dB)
Pilot tone rejection, 19kHz/38kHz	−69dB/−123dB
AM rejection	single wide, −62dB (narrow −59dB) double wide −61dB (narrow −60dB)
Capture ratio	wide, 1.5dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	single, wide −66dB/54dB (double −65dB/−51dB)
Stereo separation, 1kHz/5kHz/10kHz	−52dB/−52dB/−48dB (narrow 49dB/48dB/42dB)
Output level, 100% modulation	single, wide 752mV (narrow 707mV)
Channel balance, stereo	0.24dB
Dimension (width, height, depth)	43.5 x 5.5 x 28.5cm
Typical price inc VAT	£200

Luxman T215L

HW International Ltd, 3-5 Eden Grove, London N7 8EQ
Tel 01-607 2717

This well-presented manual analogue tuner is the successor to the *T210* which appeared in previous editions. The two are basically similar.

Decently-weighted spinwheel tuning allows the rapid selection of stations on the three UK wavebands long and medium wave AM and VHF/FM. Stereo/mono mode may be selected, this also setting the interstation noise muting the 'off' position. Aerial connection for FM is via a male co-axial socket, with binding posts for the alternative 300ohm FM ribbon aerial and for an AM aerial. Inside, the tuner houses a simple, single board circuit with an exquisitely small, close tolerance three-gang variable tuning capacitor — a classic design.

Sound quality

Set against the current standard, the *215* was rated just 'average' on sound quality, with some treble roughness and sibilant exaggeration on FM stereo. Bass seemed restricted, an aspect also noted with the previous model, while musical dynamics were moderated. On the plus side, it was quite clear and open sounding. On AM it proved unexceptional, but was probably a little above average.

Lab results

In general this tuner matched the good performance of the earlier model, with a solid radio frequency performance. Being an analogue design it was free of digitally-related whistles in the audio output, while good sensitivity and signal to noise ratio results were also obtained. The muting threshold should be higher than the 3μV noted on test; 50μV would be a more sensible level. The alternate channel selectivity was pretty good at 63dB while the pilot tone rejections were particularly good for a tuner of this price group. Capture ratio was fine at 2dB and was coupled with a strong result for AM suppression. Total harmonic distortion levels were really good in the midband, reaching a surprising 0.07% at 1kHz (stereo mode, left or right only!).

Stereo separation was fine, with figures of 38dB 1kHz, very similar to the T210. On frequency response, slightly more bass was measured with the −3dB point at 23Hz (previously 50Hz), while slight treble lift was shown, +0.65dB at 10kHz.

Conclusion

This tuner was attractively presented, and gave a competent sound on AM and FM, plus a fine radio-frequency performance suited to a wide range of reception conditions. Offering fair value, it is certainly worth considering.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	6μV/70μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−79dB/−66.0dB
Muting threshold	3.3μV
Alternate channel selectivity	−63dB
Pilot tone rejection, 19kHz/38kHz	−63dB/−81dB
AM rejection	−64dB
Capture ratio	2dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−60dB/−63dB
Stereo separation, 1kHz/5kHz/10kHz	−38dB/−35dB/−29dB
Output level, 100% modulation	562mV
Channel balance, stereo	0.02dB
Dimension (width, height, depth)	45.5 x 7 x 27cm
Typical price inc VAT	£120

RECOMMENDED

Marantz ST-151L

Marantz Audio (UK) Ltd, 15-16 Saxon Way Industrial Estate, Moor Lane, Harmondsworth, UB7 0LW
Tel 01-897 6633

This slimline digital tuner is nicely styled and superbly finished despite a modest price. It covers three wavebands, with both long and medium AM bands as well as VHF/FM. Up to eight stations on each waveband may be pre-set in memory.

Interior design is simple and tidy; the front end has the usual varicap tuning system with no moving parts, using microprocessor central control and a quartz synthesiser.

Aerial connections include a 75ohm male coaxial socket and alternative 300ohm binding posts for FM, and an external AM aerial terminal; an AM loop aerial is provided.

Sound quality

Rated a little above average on FM, this tuner sounded a bit thin with a loss of treble sweetness but conversely it showed fairly good clarity and depth. Bass was a touch weak, however. Whistles occurred above 3mV input so in very strong signal areas, a 6 or 12dB aerial attenuator may be required; whistles also appeared with signal levels below 100μV, making this model unsuitable for fringe areas as well.

On AM it sounded rather above average, with a satisfactory, articulate sound, not as nasal or as coloured as usual. This makes it a good all-rounder for local station reception.

Lab results

The RF sensitivity was poorer than average while the audio signal-to-noise ratios were unexceptional. Muting threshold was set rather low — 100μV would have been more sensible in view of the stereo performance. Alternate channel selectivity was pretty good, and this, combined with respectable results for AM rejection and capture ratio, meant that this model performed pretty well in crowded reception areas.

Total harmonic distortion was satisfactory in stereo at a little under 1%, while the stereo separation was really good at around 60dB, midband — a remarkable result here.

A healthy output of 1 volt was delivered, enough for even a 'passive' pre-amp and the channel balance was very close; frequency response was most uniform from 10Hz to 16kHz, being just 0.3dB down at 10kHz. While the pilot tone side bands were just satisfactory at 29dB down, rejection of the pilot itself was −53dB.

Conclusion

Suited to normal signal strength areas, this basic tuner gave reasonably good sound on all bands (given the intrinsic limitations of AM), and proved quite selective. A recommendation is awarded.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	26μV/105μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−65dB/−60dB
Muting threshold	28μV
Alternate channel selectivity	−72dB
Pilot tone rejection, 19kHz/38kHz	−30dB/−48dB
AM rejection	−58dB
Capture ratio	3dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−53dB/−43dB
Stereo separation, 1kHz/5kHz/10kHz	−64dB/−59dB/−49dB
Output level, 100% modulation	1026mV
Channel balance, stereo	0.03dB
Dimension (width, height, depth)	41.5 x 6.5 x 23cm
Typical price inc VAT	£79

Mission Cyrus

Cyrus Electronics Ltd, Stonehill, Huntingdon, Cambs PE18 6ED
Tel (0480) 57477

RECOMMENDED

This compact design is styled to match the *Cyrus* amplifier series and the sound is claimed to match it too! Elegantly simple, it uses a large digital display with full synthesiser operation, and covers stereo plus medium wave AM bands. Tuning is manual via an auto-seek mode, with eight presets for each band.

A standard UK coaxial socket is provided for FM while a rear mounted AM loop aerial is permanently wired in. A longer external aerial may be added for long range reception..

Sound quality

Living up to its *Cyrus* namesakes, this tuner provided satisfying audio quality on FM stereo. Tidy and musical it produced good stereo width and depth, plus pleasing ambience, a sweet treble and good detail. Backgrounds were not entirely silent, and on quiet programme the hiss level was not up to the best possible standard.

On AM, the sound was rather below average, being 'thick' with a 'hollow' coloration.

Lab results

We tested two tuners as the first provided a poor 4.8dB result for capture ratio. However, the second sample was only slightly better at 4dB, pointing to some weakness in the IF design. AM rejection (IHF) was unexceptional at 51dB and varied strongly with level. Sensitivity was fine but at low RF levels some mild background warbles were audible in stereo mode. The ultimate signal to noise ratio reached almost 60dB, which was rather poorer than the best examples in the issue; in our view, the muting level was set too low. Alternate channel selectivity was pretty good at 71dB while the pilot tone rejection (IHF, no modulation) was fine on paper at −43 and −64dB for 19kHz and 38kHz components. However, under modulation the 38kHz sidebands deteriorated to just −24dB — not a good idea for recording purposes, representing a potential source of IM beats. Stereo distortion was just average at 0.3% while separation was likewise about average, measuring 44dB mid band and falling to 35dB at 10kHz. The tuner's healthy 1V output will drive the *Cyrus* amplifier inputs satisfactorily.

Conclusion

Though 'best buy' material on sound quality grounds, this model's radio frequency performance let it down. For high-quality local station reception it will probably perform well but in more difficult conditions its abilities were questionable; at this stage the design qualifies only for a recommendation.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	7.7μV/27μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−68dB/−59.0dB
Muting threshold, R.F. level	5.5μV
Alternate channel selectivity	−71dB
Pilot tone rejection, 19kHz/38kHz	−43dB/−64dB
AM rejection	−51dB
Capture ratio	4.8dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−57dB/−50dB
Stereo separation, 1kHz/5kHz/10kHz	−44dB/−41dB/−35dB
Output level, 100% modulation	998mV
Channel balance, stereo	0.04dB
Dimension (width, height, depth)	21.5 x 8.5 x 39.5cm
Typical price inc VAT	£200

BEST BUY

NAD 4020B

Hi-Fi Markets Ltd, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737

Traditionally styled, this tuner looks much as tuners did a decade ago, but is none the worse for that. A large 'slide rule' tuning scale dominates the front panel showing clearly that here we have a traditional analogue design which still evades the almost ubiquitous synthesiser chip. I still like analogue tuners and appreciated the rapid dial response of the flywheel-loaded tuning of this model. On the debit side, preset station facilities are absent.

A simple but effective tuning indicator is used, namely two red lamps flanking a green 'OK' light. FM and the medium wave AM band are covered. Muting and mono modes can be separately engaged.

On the rear panel, in addition to the movable rod AM aerial there is also a proper UK coaxial socket for FM. Clip connectors are also provided for an additional AM aerial as well as 300 ohm and 75 ohm FM options.

Sound quality

Scoring very well on the listening tests, clean stereo reception was obtained with signal levels over 800μV. Background hiss was just satisfactory, countered by a lively and open sound, plus good stereo image, these showing fair depth and space.

The AM sound was quite presentable and in fact above average; but as usual this is not saying much!

Lab results

While not up in the super class the sensitivity was sufficient for most applications (but not extreme fringe). Stereo signal to noise leveled off at 58dB and in mono did not improve greatly while the muting threshold of 5μV was too low to give sensible service. The pilot tone rejection was fine and total harmonic distortion was satisfactory both as regards mono and stereo. Stereo separation was pretty good right up to 10kHz while the radio frequency parameters were also good, including selectivity, AM suppression (rejection of interference) and capture ratio. The audio frequency response was sensibly flat and the RF input showed a fine overload performance.

Conclusion

While this was neither the quietest or the most sensitive tuner of the group, it nonetheless provided a great sound for the money. Easy to use, it was musical as well as ambient, proving a worthy match for the NAD *3120* as well as any other comparably good amplifier. The value rating suggests a Best Buy.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	4μV/80μV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	63dB/58dB
Muting threshold	5μV
Alternate channel selectivity	68dB
Pilot tone rejection, 19kHz/38kHz	58dB/>70dB
AM rejection	60dB
Capture ratio	1.4dB
Total harmonic distortion	
at 100% mod, 1kHz mono/stereo	– 51dB/ – 50dB
Stereo separation, 1kHz/5kHz/10kHz	55dB/52dB/48dB
Output level, 100% mod	910mV
Channel balance	0.03dB
Dimensions (width, depth, height)	42 x 24 x 10cm
Typical price inc VAT	£139

Pioneer F-99X

Pioneer High Fidelity (GB) Ltd, Field Way Greenford, Middlesex UB6 8UZ
Tel 01-575 5757

RECOMMENDED

Pioneer's original *F90* tuner had a distinguished record, including high ratings in previous issues of *HFC*. In contrast with the usual policy of planned obsolescence, Pioneer have chosen to enhance this model, in the form of the *'99X*.

A total of 16 stations, eight FM and eight medium wave, may be programmed for pre-set tuning; long wave AM is not covered. Facilities include manual and power tuning, plus a variable IF bandwidth, the latter allowing optimum audio performance in 'wide' mode. The aerial socket is soldered directly to the pointed circuit, a mechanically unwise thing to do, and on our sample the initially poor sensitivity was traced to a broken connection here.

Sound quality

This design's reputation held up during the auditioning. Good on narrow IF, it improved noticeably on 'wide'. The bass was firm and clean, with exceptional stereo stage width and focus. Image depth was fairly good, though the midrange sounded a little 'thin' with a mild 'edginess' in the treble. Complementing these FM results, the AM performance was well above average.

Lab results

This tuner provided an exceptional sensitivity combined with an excellent front end, this ensuring a strong performance over a wide range of reception conditions. In 'narrow' mode, the selectivity was very good, with an excellent AM rejection. The capture ratio varied with IF bandwidth and was at its best on the wide setting. Pilot tones were rejected well and the results for ultimate signal to noise were up with the best.

Significant advances have been made over the *F90* with respect to distortion, which in 'wide' mode, full modulation stereo, held to 0.05%, −66dB — a superb result. Channel separation held well at 51dB at 1kHz, 53dB at 1kHz, 53dB 10kHz, and the results degraded little on the narrow IF setting.

Channel balance was perfect, and the audio output was 785mV from a low output impedance of 900ohms. Frequency response was wide and flat, ±0.2dB through the midband, with the −3dB points at 10Hz and 16.5kHz.

Conclusion

This powerful tuner lacked long wave but would perform well under some of the most difficult reception conditions. The sound quality was good, both on FM stereo and AM, and a strong recommendation was assured.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	2.4μV/24μV (narrow IF2.0μV/24μV)
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−81dB/−70dB
Muting threshold	13μV
Alternate channel selectivity	−15dB (narrow, 76dB)
Pilot tone rejection, 19kHz/38kHz	−60dB/−83dB
AM rejection	−76dB
Capture ratio	1.2dB (narrow, 3.0dB)
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−69dB/−66dB
	(narrow, −65dB/−50dB)
Stereo separation, 1kHz/5kHz/10kHz	−50dB/−51dB/−53dB
	(narrow, 41dB/42dB/47dB)
Output level, 100% modulation	785mV
Channel balance, stereo	0dB
Dimension (width, height, depth)	42 x 6 x 32cm
Typical price Inc VAT	£240

Proton 440

Hi-Fi Markets Ltd, Cousteau House, Greycaine Road, Watford WD2 4SB
Tel (0923) 27737

This inexpensive tuner is distinguished by the inclusion of a special IF circuit by Schotz; this also used in some NAD tuners. By modifying the IF response according to level, the Schotz circuit improves the signal to noise ratio of weak stations at the edge of the tuner's usable performance.

Covering FM and AM medium wave bands, this is a synthesiser design with six auto tuned presets for FM and for AM. Cleanly styled, the case is in satin black with all pushbutton controls. These include a Schotz noise circuit 'cancel' as well as a mono over-ride. At the rear it is usefully equipped with an output level control plus AM loop antenna and three options for FM aerial; input-clip terminals for 300 and 75 ohm plus a proper UK socket for a 75 ohms coaxial plug. Using the usual stack of integrated circuits inside, this model is made in Taiwan.

Sound quality

We were not impressed by this model. On good signal strengths some synthesiser noise was audible in the unmodulated background, though hiss levels were low. Tonally it was 'open', but transients appeared lifeless, and the bass dry and lacking in definition. The stereo presentation was satisfactory but showed depth compression.

AM performance was tidy — very bandlimited but of satisfactory clarity.

Lab results

The *440* proved very sensitive with satisfactory signal to noise ratios. However, the 3μV muting threshold was too low for good stereo reception. Selectivity was high and the multiplex harmonics were excellently suppressed. Distortion was low, in fact much better than the specification while the channel separation results were also good. The clean IF performance was shown by the very good results for the AM suppression as well as for capture ratio.

Conclusion

This tuner had an excellent RF performance, complemented by fine measured data on the audio side, and so as a radio receiver it has done its job well. However, its audio fidelity was considered to be below average and unfortunately this alone precludes any recommendation.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	2.1μV/25μV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	69dB/66dB
Muting threshold	3μV
Alternate channel selectivity	70dB
Pilot tone rejection, 19kHz/38kHz	83dB/>95dB
AM rejection	70dB
Capture ratio	1.0dB
Total harmonic distortion	
at 100% mod, 1kHz mono/stereo	– 67dB/ – 63dB
Stereo separation, 1kHz/5kHz/10kHz	55dB/47dB/42dB
Output level, 100% mod	170mV to 1,350mV variable
Channel balance	0.12dB
Dimensions (width, depth, height)	42 x 25 x 11cm
Typical price inc VAT	£189

REVISED AND REPRINTED

RECOMMENDED

Quad FM4

Quad Electroacoustics Ltd, 30 St Peters Road, Huntingdon, Cambs PE18 7DB
Tel (0480) 52561

A characteristically distinctive design from this famous British company, this middle-priced Quad tuner has been intelligently designed and works with a minimum of fuss. A large, well-weighted tuning knob gives manual station selection, the tuned frequency shown on the large digital display. A combined signal-strength/centre-tune bar graph is included in the display, and was found to work well. Seven pre-set stations may be automatically programmed, appropriately marked BBC 1 through 4; BBC LR (local radio); and ILR1/ILR2 for the local commercial stations.

Rear panel facilities include a three-pin IEC mains input, a shrouded IEC three-pin mains outlet, plus a 75ohm (female) coaxial aerial socket and a DIN audio output. Both finish and constructional standard are very high.

Sound quality

Despite digital tuning, the *FM4* had clean backgrounds free from the usual annoying whistles. By the time input reached 1mV, it showed decently quiet stereo backgrounds, and the sound quality was much favoured, scoring up with the best in this group. Stereo images were well focused, and pleasing depth was reproduced. Tonally it sounded quite neutral, and the treble was free of grain or harshness. Some mild loss of detail and bass attack was apparent when compared with the original sources, which was nonetheless a favourable result when the attainment of some of the other models is taken into account.

Lab results

The *FM4* was quite sensitive, reaching the 50dB stereo quieting (1kHz ref, CCIR/ARM) by 70μV and ultimate stereo signal-to-noise ratio by 2mV with a 66dB recorded which is a satisfactory result, and slightly better than the broadcast chain. This tuner was not at its best separating a weak from a nearby strong station with a selectivity of around 50dB, which was rather below average. Conversely AM rejection and capture ratio were quite good. Output level was lower than usual at 300mV but good pilot tone rejection was shown. Total harmonic distortion was about average with 0.25% mono and 0.5% stereo (full modulation, left or right channel only). It also responded well to overmodulation, and attained good stereo separation.

Conclusion

This tuner appeals on the grounds of its fine sound, excellent ease of use, good build, and finish and a more than satisfactory technical performance. Clearly a quality design.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	7μV/70μV
Ultimate signal-to-noise (CCIR/ARM)	
Mono/stereo	70dB/66dB
Muting threshold	—
Alternate channelselectivity	–49dB
Pilot tone rejection	–63dB
AM rejection	–61dB
Capture ratio	1.8dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	0.25%/0.35%
Stereo separation, 1kHz/5kHz/10kHz	48dB/38dB/30dB
Output level, 100% mod	300mV
Dimensions (width, depth, height)	32 x 21 x 6cm
Typical price inc VAT	£269

Rotel RT-850L

BEST BUY

Rotel Hi-Fi, 25 Heathfield, Stacey Bushes, Milton Keynes MK12 6HR
Tel (0908) 317707

Rotel's two new tuners, the *'830* and *'850* have been designed with an accent on sound quality — in a sense they are of the 'BX' generation. The *RT-850* is the more expensive model, and covers FM stereo, medium and longwave bands; a full digital design, it offers both auto-seek 'power' tuning and manual frequency entry. In power tune mode, the muting threshold is sensibly set to ignore weak, noisy stations.

Sound quality

Justifying designers' efforts, the *'850* scored well in the listening tests, and was one of the best sounding models at the price level. The FM stereo showed a good rendition of depth and ambience, coupled with fine central focus and width; tonally, it was sweeter than usual, with good perspectives, and a clear sparkling treble.

Unfortunately, on AM the sound was barely average even allowing for the inherently poor sound of this waveband. It was however relatively crisp and intelligible, particularly on voice.

Lab results

The RF performance was substantially good, with a decent sensitivity coupled with other figures which point to a good performance in fringe reception areas. Background whistles were suppressed well but the rejection of ultrasonic signals was not as effective. Rejection of the exact pilot tone frequency was numerically quite good, but in the presence of normal modulation, spurious sidebands appear at only 23dB down. Ultimate signal to noise ratios were more than satisfactory. Alternate channel selectivity was to a decent standard while both the AM suppression and capture ratio were first rate.

On stereo, worst case, harmonic distortion held to 0.2% in the midband, which was a fine result, while stereo channel separation was also pretty good. Channel balance was excellent, while stereo frequency response proved to be very flat and extended at only 1dB down, 10Hz, and 3dB down at 17.5kHz. At high signal strengths some variation in AM rejection was noted; for example, 50dB at 30mV, and some spurious RF responses were also apparent.

Conclusion

With sound quality regarded as a major parameter in *Hi-Fi Choice* assessments, the *RT-850L* happily scored a Best Buy in its price category, furthermore, the basic tuner performance was also pretty good.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	2μV/17μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	–73dB/–63dB
Muting threshold	4.4μV
Alternate channel selectivity	68dB
Pilot tone rejection, 19kHz/38kHz	–40dB/–51dB
AM rejection	–66dB
Capture ratio	1.1dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	–63dB/–55dB
Stereo separation, 1kHz/5kHz/10kHz	–40dB/–42dB/–34dB
Output level, 100% modulation	575mV
Channel balance, stereo	0.01dB
Dimension (width, height, depth)	43 x 6.5 x 31cm
Typical price inc VAT	£150

BEST BUY

Sansui TU-D99XL

Sansui (UK) Ltd, Unit 10A, Lyon Industrial Estate, Rockware Avenue, Greenford, Middlesex
Tel 01-575 1133

This slimline compact model is an upmarket design with a comprehensive specification. A quartz locked synthesiser model, it offers FM coverage as well as AM medium wave, with 8 auto-tuned preset station positions on each band. Details include a record calibration tone at −6dB on peak level, plus a local/normal switch for front end sensitivity and a normal/narrow IF switch to aid separation of closely spaced stations. There is also a noise suppressor for weak stereo stations. At the rear, a Japanese-style coaxial connector is fitted using a special plug which has to be made up. 300 ohm FM connection is via binding posts and these also serve for the AM loop antenna.

Sound quality

Scoring very well on the listening tests, the *'99* produced just slight background whistles, which had cleared by the 200μV input level, and from 500μV upwards the stereo output was very quiet. It presented a close copy of the original source, although the merest dulling of transients was noted. Otherwise the sound — stereo, depth, and tonal neutrality — all met high standards. High level RF blocking was cleared via the 'local' switch.

The AM sound was thought unpleasant with a notable hardness and ringing sound. Here it rated below average.

Lab results

The *'99X* acquitted itself well in the lab tests. The RF performance was fine with very good sensitivity, a sensible muting threshold and excellent AM suppression as well as capture ratio. Selectivity was satisfactory in 'normal' and very good in 'narrow' IF mode. Signal to noise ratios were up with the best, while harmonic distortions held to a fine 0.1%, −60dB, in all conditions. Channel suppression was very good in normal mode and was still more than satisfactory in 'narrow'; for this tuner 'narrow' mode operation was no hardship. Output level was healthy, balance very good with the frequency response respectably flat.

Conclusion

With a front rank sound quality and a very strong RF performance, this is clearly a fine tuner design. Suited, with the 'local' switch, to both fringe and high strength locations, a versatile performance is offered, and if the AM section is not considered important, it could fit the bill nicely. The *'99X* represents very good value in its price sector, and qualifies for a Best Buy rating.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	2.5μV/25μV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	76dB/71dB
Muting threshold	40μV
Alternate channel selectivity	40dB/75dB
Pilot tone rejection, 19kHz/38kHz	71dB/>93dB
AM rejection	68dB
Capture ratio	1.0B
Total harmonic distortion	
at 100% mod, 1kHz mono/stereo	−60dB/−63 (−60°)dB
Stereo separation, 1kHz/5kHz/10kHz	55/58/52dB (37/40/42°)dB
Output level, 100% mod	825mV
Channel balance	0.15dB
Dimensions (width, depth, height)	43 x 26 x 5cm
Typical price inc VAT	£230

°Narrow IF bandwith

Sony ST-JX220L

Sony UK Ltd, Sony House, South Street, Stalnes, Middlesex TW18 4PF
Tel Stalnes 61688

This inexpensive digital tuner has a comprehensive specification. With a backlit liquid crystal display for digital frequency indication, it can store the location of up to five stations per waveband. As is now common with tuners aimed at the UK market, three wavebands are covered, including long wave, as well as medium wave AM and VHF/FM bands. Once pre-set, operation is very easy; however, I still find digital tuning controls frustratingly awkward as you frequently need to backtrack in order to find the right setting.

The small AM aerial is supplied on a short lead, allowing it to be positioned freely to give the best reception, and preferably away from a working CD player which can produce noticeable radio breakthrough. A larger external AM aerial may also be used, and without a good aerial, there are few locations where satisfactory FM reception will be achieved.

Sound quality

This tuner suffered from low-level whistles in the audio output, which were not properly suppressed until over 500μV of RF signal was applied. Weak stereo stations are not therefore recommended! Once under way, the sound quality rating was above average, with clean bass, good stereo focus and width plus fair depth. The treble range was considered bright but not seriously so.

Given the inherent limitations of AM sound performance on this band was rated equally with that on FM — a good result for the class. Relatively uncoloured, distortion levels were quite low, a pleasant sound here also.

Lab results

On test this unit bettered some of its specifications such as selectivity, and AM suppression, but fell short on sensitivity and capture ratio, the latter nonetheless reaching a fine result. Distortion was satisfactory, while stereo separation was held to a good standard.

On frequency response, some treble lift was observed, for example +1dB at 16kHz, while pilot tone sidebands were quite strong at −29dB. The measured signal to noise ratio varied with signal level and under normal conditions will sound better than the measurement indicates.

Conclusion

The level of audio whistles present barred this model from recommendation but it did perform pretty well under good reception conditions and with an AM sound quality that was considerably above average. FM stereo was also pretty good, and so the *220L* remains worth considering.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	19μV/100μV
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−69dB/−53dB
Muting threshold	24μV
Alternate channel selectivity	65dB
Pilot tone rejection, 19kHz/38kHz	−28dB/−46dB
AM rejection	57dB
Capture ratio	2.0dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−46dB/−47dB
Stereo separation, 1kHz/5kHz/10kHz	−49dB/−43dB/−38dB
Output level, 100% modulation	698mV
Channel balance, stereo	0.11dB
Dimension (width, height, depth)	43 x 5.5 x 26cm
Typical price inc VAT	£90

Technics ST-G4L

Panasonic (UK) Ltd, 300-318 Bath Road, Slough, Berks
Tel (0753) 34522

Placed in the upper price group, which contains a number of excellent performers, the *ST-G4L* is a digital design which sports a number of features. Up to 18 stations may be pre-set on the three wavebands, VHF/FM, medium and long wave. AM; on FM, there are two IF bandwidth options, namely 'wide' for the best sound in good conditions and 'narrow' for a more selective tuner performance when conditions demand it.

Auto-seek and manual tuning are provided with an optional 2kHz frequency offset, which may be helpful for optimum tuning. The threshold level for auto seek may be programmed in three steps.

Sound quality

On FM stereo the sound was rated above average. Tonally, the mid was a touch 'thin', even slightly 'reedy', and the treble somewhat 'bright'. The bass was above average but the stereo focus was not exceptional, and while the general level of musical detail was fine, it did not have much depth or ambience. On 'narrow' some deterioration occurred.

On AM, given the limitations of these wavebands, it rated as good, probably the best yet! It demonstrated a pleasant nature, and sounded comparatively open and articulate.

Lab results

No records were set here, with moderate sensitivities and signal to noise ratios. Alternate channel selectivity was unexceptional in 'narrow' while the pilot tones were just satisfactorily suppressed. On low RF inputs, some whistles were apparent in the audio output.

The AM reception was disappointing at 47dB (IHF), and varied considerably with RF level. Capture ratio was about average. In 'wide' mode, the harmonic was pretty low at under 0.1%, even at full modulation in stereo. Good midband channel separation figures were achieved.

Audio output level was on the low side, at 0.5V for full modulation. A good frequency response of 40Hz to 10kHz ±0.1dB was noted, the response extending overall from 5Hz to 15kHz with minimal loss. Pilot tone side bands were excessive, at −24dB under full modulation, while some front-end spurious responses were identified.

Conclusion

At this price, digital whistles should really be inaudible, while the RF performance could also have been better. With its three band coverage this tuner did however have a balanced sound on all wavebands, and taken overall this makes it worth considering.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise ratio	
Mono/stereo	10μV/42μV (narrow IF, 10μV/34μV)
Ultimate signal-to-noise (CCIR/ARM/1kHZ ref)	
Mono/stereo	−70dB/−61dB
Muting threshold	19μV
Alternate channel selectivity	−65dB
Pilot tone rejection, 19kHz/38kHz	−39dB/−35dB
AM rejection	−47dB
Capture ratio	2.4dB
Total harmonic distortion	
At 100% mod, 1kHz, mono/stereo	−65dB/−62dB
Stereo separation, 1kHz/5kHz/10kHz	−48dB/−47dB/−41dB
Output level, 100% modulation	524mV
Channel balance, stereo	0.21dB
Dimension (width, height, depth)	43 x 6.5 x 25cm
Typical price inc VAT	£180

REVISED AND REPRINTED

Technics ST-G7

Panasonic (UK) Ltd, 300-318 Bath Road, Slough, Berks
Tel (0753) 34522

RECOMMENDED

Technics have long enjoyed a reputation for producing good tuners; the *ST-G7* reviewed here is a recently-introduced upmarket model whose comprehensive facilities include a socket for connection to a computer terminal.

A chunky-looking unit, it is finished in the traditional Technics dark bronze, and sports a backlit liquid crystal display like the Revox. It is a synthesiser design, and an array of push-buttons allow pre-selection of up to 16 stations from the FM and medium wave bands. A special 'gold' capacitor provides power for the preset station memories even if the unit is switched off for a week.

Automatic or manual switching for two IF bandwidths is possible affording optimised reception, and the display is also calibrated to read signal strengths in dB. Fine setting of AM and FM synthesised frequencies is possible while a recorder calibration output is also provided.

Sound quality

Highly rated on test, the stereo quality was well in hand by 400μV of signal strength, and the background was clear of whistles once perfectly in tune. Audio quality was considered to be close to the original source, with good dynamics. Good stereo, depth and focus as well as a wide neutral frequency range were also apparent.

However it sounded quite poor via AM with a muffled and laboured effect. Heavy coloration was also present and on the whole it was considered quite fatiguing to listen to.

Lab results

Our test methods differ in some respects from those used to specify the *G7*, and the results are further complicated by a dual bandwidth IF. On 'wide', which gives best sound quality, sensitivity was normal while signal to noise ratios were also very good. (CCIR ARM 1kHz.) Alternate channel selectivity was satisfactory in 'wide', and good in 'narrow'. Multiplex tone rejection was excellent — no trace of it could be found! AM rejection was also excellent together with a fine capture ratio.

Harmonic distortion, while excellent in mono degraded to 'satisfactory' in stereo, which was a pity. Channel separation was very good in 'wide' but rather worse in the narrow IF mode.

Conclusion

In the optimum 'wide' mode the audio performance was very good, with the RF parameters a little less so. 'Narrow' will allow reception in difficult conditions but is a compromise nonetheless. The overall sound quality was much liked, and if viewed together with its features and major test results, indicates a value level that is sufficient for a recommendation even at this high price.

GENERAL DATA	Tuner
Sensitivity for 50dB signal-to-noise	
Mono/stereo	5μV/50μV
Ultimate signal-to-noise (CCIR/ARM, 1kHz ref)	
Mono/stereo	77dB/70dB
Muting threshold	8μV
Alternate channel selectivity	47dB/72dB
Pilot tone rejection, 19kHz/38kHz	>90dB/90dB
AM rejection	>70dB
Capture ratio	1.5dB
Total harmonic distortion	
at 100% mod, 1kHz mono/stereo	– 70dB/ – 55 (– 34*)dB
Stereo separation, 1kHz/5kHz/10kHz	53 (20*)dB/ 45 (16*)dB/36dB
Output level, 100% mod	675mV
Channel balance	0.7dB
Dimensions (width, depth, height)	43 x 28 x 10cm
Typical price inc VAT	£370

**Narrow IF bandwidth*

HFN/RR ACCESSORIES CLUB

A résumé of the monthly selection from our team of renown HiFi reviewers.

	tick box	*indicate quantity*
The Goldring Stylus Cleaner @ £11.50p inc p&p	☐	☐
The Mission Isoplat @ £19.50 inc p&p	☐	☐
The 'Tweek' @ £15 inc p&p	☐	☐
The Michell Banana plus @ £9.50 per set inc p&p	☐	☐

Audiophile Records
☐ Cantate Domino (£6.95) ☐ Saint-Saens (£6.95) ☐ Close-Ups (£6.95) ☐ Jazz at the Pawnshop (2 LP's £13.95) ☐ Däfos (£12.95) all records reviewed in *HFN* January 1985, prices to include p&p

Quadropod Spikes @ £8.00 per set inc p&p & Jig @ £4.00	☐	☐
HFN/RR 'Flux Dumper' @ £22.00 inc p&p	☐	☐
Nagaoka record sleeves @ £6.70 inc p&p (set of 50)	☐	☐
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HFN/RR Black Head MC Transformer £46.15	☐	☐
HFN DC1 Loudspeaker Kit (Complete) £129.99	☐	☐
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SUMMARY REVIEWS
TUNERS

These brief reviews cover additional tuners which have been previously fully tested, but which have had to be omitted from the full reviews. Discontinued models may be available at advantageous prices.

Denon TU710
Easy to use, this conventional (analogue scale) tuner scored well above average on last year's listening tests, giving a sound with stereo depth and precision and low hiss. AM sound (MW and LW) was pleasant enough. Ultimate signal to noise was 65dB stereo/73dB mono, selectivity was fine at 60dB, and other measurements satisfactory. Now officially discontinued, the slim black *710* was recommended last time, when on sale at £90.

Naim NAT 01 (£900 inc power supply)
Naim's FM-only tuner is priced on a par with the Revox *B261*, but no facilities are provided bar the manual tuning knob with a digital display indicating the tuned frequency. The power supply is a separate unit like those for the Naim pre-amps, which the tuner itself also resembles. It scored very well on sound quality. Detail in the depth plane was subdued, but frontal stereo focus was coherent and precise. Technical performance was satisfactory and this design can be recommended.

Pioneer TX-301L
When tested this now-deleted model cost £85, at which low price it offered digital synthesiser operation, LW, pre-set tuning of eight channels each on FM and AM (MW and LW). It sounded surprisingly clear, with presentable stereo depth, 'space' and focus. Although below average, at its low price the *TX301L* rated as a Best Buy last time round.

Revox B261 (£897)
This remarkable FM-only tuner is built to the high standards of professional equipment and has a host of facilities ranging from adjustable muting threshold and auto aerial rotation to twin volume-adjustable headphone sockets and (optional) remote control. Digitally synthesised, it offers 20 FM pre-sets, while station names can be displayed on selection. Sound quality rated as good while technical results were exemplary and this model must be recommended — on a hill site in southern England, many of Europe's transmitters will be accessible.

BEST BUYS AND RECOMMENDATIONS
TUNERS

This page attempts to sum up the strong points of those models we have picked as the best performers among those tested. With the emphasis mainly on sound quality, we also rated the tuners on their ability to cope with difficult reception conditions. Please note that the full picture is only obtained by reading the reviews themselves.

BEST BUYS

These models are those we found gave exceptional value for money coupled with a substantially good performance.

NAD 4020B (£139)
With a fine modern performance and competitive sound quality, this analogue model still represents good value.

Rotel RT850L (£150)
This full digital design should provide good reception even in fringe areas, and scored very well on sound quality.

Sansui TUD99X (£230)
This top performing tuner set records for both measured performance and sound quality for the price. It will be hard for many to justify spending more than this.

RECOMMENDATIONS

The following models are recommended on the basis of good value with the accent on improved performance in the case of the more costly models. Sound quality improves with price only up to a certain point but performance as a selective receiver continues to get better as cost increases.

Denon TU-717 (£90)
With good measured performance for the price, the *TU-717* was also rated as satisfactory on sound quality.

Hitachi FT-5500 II (£200)
In its *MkII* form, this classic design scored on excellent radio performance, designed to cope with a range of reception conditions, coupled with a basically good audio quality.

Marantz ST151L (£79)
This nicely styled and very well finished digital tuner gave acceptable technical results, and while best suited only to normal reception areas, did give good sound on all bands.

Mission Cyrus (£200)
Rating very highly on sound quality, this tuner was not so impressive on radio performance, making its potential abilities in poorer reception areas less than outstanding and hence missed a Best Buy classification.

Naim NAT-01 (£900)
With a sound quality described most easily as 'nice', this very expensive tuner did more or less justify its price for those who can afford it, with adequate radio frequency performance.

Pioneer FX-99X (£240)
Replacing the famous F90, this digital tuner offered exceptional radio performance suiting it to almost any reception conditions, along with basically good sound quality.

Quad FM4 (£269)
An ergonomic delight, this FM-only model is the epitome of clean design. With a very competent all round performance and a pleasing sound, this classic has a continuing recommendation.

Revox B261 (£890)
A flagship tuner, this versatile model had a wealth of facilities including auto aerial rotation. For the serious FM radio enthusiast the RF performance was also excellent while the audio was pretty good as well.

Sugden T28 (£173)
Somewhat improved since its introduction the *T28* (not reviewed this time) still gets a recommendation on sound quality grounds even though it is FM only and both appearance and operation leave something to be desired.

Technics ST-G7 (£370)
Comprehensive facilities and a generally impressive level of technical performance are combined in this upmarket Technics tuner, which also rated highly in listening tests for the '85 tuner test programme. Despite its high price and lack of long wave, this well-finished model from Technics can again be recommended.

Reception conditions

When choosing a tuner, you must consider its ability to deal with prevailing reception conditions as well as its actual audio quality.

For a DX broadcast enthusiast, the Revox *B261* is without peer, as even its signal strength meter can be relied upon over a wide dynamic range. A good sounding modern tuner bristling with modern technology is the Pioneer F-99X, which is an exceptional performer in fringe reception conditions as well as in town. The Hitachi *5500* and Sansui *99X* were also good on weaker signals.

If reception conditions are reasonable, the Quad *FM4* provides a very good sound. At a small sacrifice in fidelity some much cheaper tuners will also fit the bill.

With some of the newer recommendations in this issue one can have one's cake and eat it! Several low cost models proved to be both sensitive and offer a good sound quality.

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 whose demonstration facilities and dedication to customer satisfaction meet the very highest standards.

Conventional technical specifications, admirable though they may be, do not tell you how hi-fi will sound. Plenty of equipment can be made to jump through the technical hoops, and sounds 'very hi-fi', but will still reproduce music in a way that is inaccurate, coloured, tiring, and subtly unsatisfying.

Such equipment offers an insidious long-term disincentive to music listening. Ask people who have recently bought a new hi-fi system whether they are pleased with it, and they will almost always say yes — after all, they felt it was the right decision at the time, and it may have sounded 'impressive' in a very brief, loud demonstration. Ask the same people whether they now spend more time listening to music than before, and you will find out if the system is really any good.

The split between 'mass market' audio and 'specialist' hi-fi has now become almost total. All-in-one 'rack' and 'midi' systems now tend to compete on looks, features and price rather than on sound quality, though claiming adequate technical performance; on the other hand, the specialist manufacturers have tried to make products that sound better, leaving out superfluous facilities and paying attention to aspects of the design which they find have audible effects on the sound, not just those which produce better paper specifications.

Of course, anything which can be heard must ultimately be technically explicable, even if the explanation is not currently to hand, and the *Hi-Fi Choice* reviewers have always led the way in developing new measurements which really do relate to the audible performance of the equipment. But the quality of any hi-fi component is determined by the balance of many more or less measurable factors, in what the designer judges to be the best possible compromise. When components are put together, the interactions and subtle blendings of their characteristics contribute to the overall system sound in extremely complex ways. And in any case, the final quality of the music played through the system will depend fundamentally on the room it is being used in! There really can be no substitute for listening to the system for yourself.

This is why *Hi-Fi Choice* has always insisted that the hi-fi buyer should never rely uncritically on equipment reviews — even its own! — but should seek the fair unpressurised demonstration which is available only at a good dealer. It is not merely coincidence that the dealers who offer this kind of service are usually those who stock a good range of equipment from the 'specialist' manufacturers, and they will be ready to demonstrate the audible superiority of a carefully-chosen 'separates' system to the run-of-the-mill rack or midi system.

Of the dealers who are genuinely dedicated to hi-fi excellence, a growing number are members of BADA, the British Audio Dealers Association. BADA was established in 1982 on the premise that the retailing of quality hi-fi products is a specialist service which requires more expertise than the selling of less sophisticated goods. BADA recruits dealers who are 'serious about hi-fi' and who have been in business for at least three years. Member retailers are committed to offering the best possible demonstration facilities and advice; to offering (with certain conditions) exchange or refund on goods that prove unsatisfactory in use at home; and to providing a two-year labour and parts guarantee, transferable to any other BADA dealer if the customer moves home more than 30 miles after purchase. Virtually all BADA members are included in the Directory.

Make an appointment

Before visiting any shop, check whether an appointment is necessary — so that the dealer will be able to give you his full attention when you arrive for a demonstration. Take some of your own records along — they will save you wasting time getting used to strange material and wondering how it would have sounded on your old equipment. Don't worry if you feel you are ignorant of technicalities — just take your ears along with you, and don't be afraid to believe them. Don't go in with fixed ideas about equipment, which may make you pre-judge what you hear. Realise that any system will sound different in your home listening room — do use home trial facilities, remembering that this service costs the dealer time and trouble but also be aware that it may put just a little more pressure on you to buy. Don't worry if you have only a limited budget — 'real' hi-fi certainly need not always be more expensive than a package system.

A good system will make all your records sound better and give years of pleasure. The first step is to seek out the genuine hi-fi specialists in your area. With the Selected Dealer Directory, you will find them.

SELECTED DEALER DIRECTORY

AVON

ABSOLUTE SOUND AND VIDEO, 65 Park St, Clifton, Bristol. (0272) 24975. A&R, Denon, Dual, Meridian, Mission, NAD, Quad, Rotel, Technics, Yamaha, etc. (cl. Weds)
BADA MEMBER

AUDIO BRISTOL LTD, 8 Park Row, Bristol 1. (0272) 291931. AKG, Beyer, Dual, Mordaunt-Short, Revox, Sansui, Tannoy, Toshiba, Trio, Quad. Open Mon-Fri, 9-5.30, Sat 9-4.30 Home trial facilities, free installation, credit facilities, service dept.

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. Open Tues-Sat, 9-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard.

PAUL ROBERTS HI-FI, 31-33 Gloucester Rd, Bristol. (0272) 429370. Stock a full range of hi-fi from over 60 brands. Specialise in C.D. Dem facilities available. Open Mon-Fri 9.30-7.30, Sat 9.30-6.00. Home trial facilities. Free installation. Instant credit. Credit cards: Access, Visa, Amex. Service dept available.

PAUL ROBERTS HI-FI, 203 Milton Rd, Weston-Super-Mare. (0934) 414423. Stock a full range of hi-fi from over 60 brands. Specialise in C.D. Dem facilities available. Open Mon-Fri 9.30-7.30, Sat 9.30-6.00. Home trial facilities. Free installation. Instant credit. Credit cards: Access, Visa, Amex. Service dept available.

BERKSHIRE

FRASERS, HI-FI & VIDEO, 67 Dedworth Rd, Windsor, (07535) 59662. Aiwa, Dual, Mitsubishi, Mordaunt Short, Pioneer, Sansui, Trio, Wharfedale, Sharp. Dem facilities available. Open 9.30-6p.m. Home trial facilities, free installation, credit facilities. Credit cards: Access, Barclaycard, Visa. Service dept.

READING HI-FI CENTRE, 4-6 Harris Arcade, Friar St, Reading. (0734) 585463. 'The best equipment, advice and service from Berkshire's premier Hi-Fi emporium'.
BADA MEMBER

BUCKINGHAMSHIRE

AUDIO INSIGHT LTD, 53 Wolverton Rd, Stony Stratford, Milton Keynes. (0908) 561551. A&R Audiolab, Heybrook, KEF, Linn, Mission Cyrus, Musical Fidelity, Nakamichi, Nytech, Rotel. Dem facilities available. Open Tues-Sat. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

AYLESBURY HI FIDELITY, 98 Cambridge St, Aylesbury. (0296) 28790. Dual, Heybrook, Linn arms, Musical Fidelity, Mission, NAD, Nakamichi, Quad, Rotel. Dem facilities 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.

CHILTERN HI-FI, 146 High St, Aylesbury, Bucks. (0296) 31020. A&R, Aiwa, Akai, A&R, B&W, Bang & Olufsen, Dual Nakamichi, Technics, Yamaha. Dem facilities available. Open 9.30-5.30 Mon-Sat, Fri 9.30-7.00 closed Thurs. Home trial facilities, free installation, instant credit up to £2,000. Credit cards: Access, Barclaycard. Service dept.

JCV HI-FI SUPER STORE, 1 Viscount Way, Dukes Drive, Bl. (0908) 36734. Everything from specialist hi-fi to midi-systems all at the best prices.
BADA MEMBER

CAMBRIDGESHIRE

CAM AUDIO, 110 Mill Rd, Cambridge. (0223) 60442. A&R, Creek, Linn, Mantra, Mission, Naim, Nakamichi, Rega, Revolver, Teac. Dem facilities: 3 single speaker rooms. Appointment required for one not for 2. Open 9.30-6.30 Mon-Sat 9.30-3.00 Thurs. Free installation, interest free credit. Credit cards: Access, Amex, Barclaycard, Diners.

HI-FI PEOPLE, 42 Cowgate, Peterborough. (0733) 41755. 'Shop and home demonstrations from friendly people'.
BADA MEMBER

STEVE BOXSHALL AUDIO, 41 Victoria Rd, Cambridge. (0223) 68305. Audiolab, Gale, JBL, Marantz, Mission, Nakamichi, Quad, Rogers, Rotel, Tannoy. Dem facilities 2 rooms, ring for appointment. Open 10-6. Mon-Sat. Free installation, credit facilities. Credit cards; Access, Barclaycard. Service dept.

CHESHIRE

ASTON AUDIO, 4 West St, Alderley Edge. (0625) 582704. Celestion, KEF, Musical Fidelity, Opus, Pink Triangle, Quad, Roberston, Spendor, Sondex, Tannoy. Dem facilities: 4 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. (Hadgate 0925) 828009. 'Largest choice of specialist Hi-Fi in N.W. £100-£20K'. All c.cards. dem.rooms.
BADA MEMBER

CHRIS BROOKS AUDIO, 29 Gaskell St, Stockton Heath, Warrington. (0925) 61212. Single speaker pair dems. Specialising in Linn, Rega, etc. Systems from £350.00.
BADA MEMBER

NEW DAWN HI-FI, 1-3 Castle St, Lower Bridge St, Chester. (0244) 24179. Linn, Quad, Technics, National Panasonic, Denon, Rotel, Dual, Meridian, Aiwa, Philips. Dem facilities: 2 dem rooms. Open 9.00-5.30 Mon-Sat, closed Wed. Free installation, instant credit. Credit cards: Access, Barclaycard, Trustcard. BADA MEMBER

SWIFT OF WILMSLOW, 4-8 St Annes parade, Wilmslow. (0625) 526213. A&R, Aiwa, Denon, Dual, Marantz, Mission, Monitor-Audio, Pioneer, Yamaha, NAD. Dem facilities available. Open Mon-Sat 9.15-5.45. Closed 1-2 Lunch. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard. Service dept.

CORNWALL

TRURO HI-FI, ETS Ltd, 25 King St, Truro. (0872) 79809. A&R, Denon, Dual, Heybrook, Mission Cyrus, Quad, Rotel, Teac/Tascam, Thorens. Dem facilities: Single speaker studio. Open Mon-Sat 8.45-5.30. Home trial facilities, credit up to £1,000. Credit cards: Access, Barclaycard, ETS. Service dept.

DERBYSHIRE

ACTIVE AUDIO, 12 Osmaston Rd, The Spot, Derby. (0332) 380385. 2 studios. Open Mon-Sat 9.30-6.00. All major credit cards. Finance available.
BADA MEMBER

DORSET

BLACKMORE VALE, The Square, Gillingham, Dorset. (07476) 2474. A&R, Ariston, Boston, Dual, Kef, Marantz, NAD, Nagaoka, Sennheiser, Yamaha. Dem facilities available. Open Mon-Sat 9-5.30 Closed for lunch 1-2. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard. Service dept.

ESSEX

A.T. LABS, 442/4 Cranbrook Rd, Gants Hill, Ilford. (01) 518 0915. Open Mon-Sat, 10-6. Two single speaker dem. rooms. Access, Amex, Barclaycard.
BADA MEMBER

SELECTED DEALER DIRECTORY

BEECHWOOD AUDIO, 6 Market St, Braintree. (0376) 29060. A&R, B&W, KEF, Meridian, Musical Fidelity, NAD, Nakamichi, Pink Triangle, Quad, Sondex. 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 facilities: Access, Amex, Diners, Visa.

BRENTWOOD MUSIC CENTRE, 2 Ingrave Rd, Brentwood. (0277) 221210. Acoustic Research, B&W, Dual, JBL, Marantz, Nakamichi, Quad, Sansui, Tannoy, Yamaha. Dem facilities available. Open Mon-Sat 9.30-5.30. Home trial facilities, free installation. Credit cards: Access, Visa. Service dept.

RUSH HI-FI & VIDEO, 5/6 Cornhill, Chelmsford. (0245) 57593. Akai, Aiwa, JVC, Marantz, NAD, Quad, Rotel, Sansui, Sony, Technics. Dem facilities available, ring for appointment. Open Mon-Fri 9.30-6.00 Sat 9.00-5.00. Home trial facilities, free credit. Credit cards: Access, American Express, Barclaycard, Diners. Service dept.

GLOUCESTERSHIRE

ABSOLUTE SOUND AND VIDEO, 40/42, Albion St, Cheltenham. (0242) 583960. A&R, Denon, Dual, Linn, Meridian, Mission, NAD, Rotel, Technics, Yamaha, etc. (Cl. Wed) BADA MEMBER

ETTLES AND BUMFORD, Brewery Court, Cirencester. (0285) 3946. ADC, Aiwa, Ortofon, Celestian, Grundig, Harman-Kardon, Hitachi, JBL, Teac, Trio. Dem facilities: One single speaker dem room. Open Mon-Sat 9.00-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

HAMPSHIRE

ANDOVER AUDIO, 105 High St, Andover. (0264) 58251. Bang & Olufsen, Fisher, Aiwa, Marantz, NAD, Philips (CD), Proton, Rotel, Trio, Yamaha. Open Mon-Sat 9-5.30. Weds 9-1.00. Fri 9-8.00. Home trial facilities, free installation, credit facilities available. Credit cards: Access, Amex, Diners, Visa. Service dept.

HAMPSHIRE AUDIO Ltd, 2-12 Hursley Rd, Chandlers Ford. (04215) 2827/65232. Quality CD and analogue agencies. 5 Dem studios. Large free car park. BADA MEMBER

TRU-FI SOUND AND VISION, 10/12 Grosvenor Rd, Aldershot. (0252) 26390. Akai, Aiwa, B&W, Nakamichi, Hitachi, JPW, Mission, Mordaunt-Short, Nagaoka, Sony Technics. Dem facilities available. Open 9.30-6.00 Mon-Sat. Free installation, instant credit up to £1,200. Credit cards: Access, Barclaycard. Service dept.

HERTFORDSHIRE

ACOUSTIC ARTS Ltd, 101 St. Albans Rd, Watford, Herts. (0923) 45250. A&R, Audiolab, Beard, Conrad-Johnson, Denon, Heybrook, Magneplanar, Mission, Quad, Rogers. Dem facilities: 2 dem studios, ring for appointment. Open Mon-Sat 9.30-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

RADLETT AUDIO, 141 Watling St, Radlett WD7NQ. (09276) 6497. Audio Innovations, Audio Research, Creek, Krell, Linn, Magnepan, Musical Fidelity, Monitor Audio, ProAc, Rega. Dem facilities: single speaker dem room. Open Mon-Sat 9.30-5.30. Home trial facilities. Free inst. Credit up to £1,000. Credit cards: Barclaycard, Visa.

KENT

JOHN MARLEY HI-FI CENTRES, 2 Station Rd West, Canterbury. (Canterbury) 69329. 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 cl. Wed. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Barclaycard, Creditcharge. Service dept.

PHOTOCRAFT HI-FI, High St, Ashford, Kent. (0233) 24441/2. Open Mon-Sat 9.00-5.30. Wed-1 p.m. Free delivery. Int free credit. Access, Visa. BADA MEMBER

LANCASHIRE

MONITOR SOUND, 54 Chapel St, Chorley. (02572) 71935. A&R, Dual, Mission, Quad, Rogers, Rotel, Spendor, Thorens, Nakamichi, Yamaha. Dem facilities. 2 dem rooms. Open Mon-Sat, closed Weds. Home trial facilities, free installation, instant credit up to £1,000. Credit cards Access, Visa. Service dept.

PRACTICAL HI-FI, 198 Church St, Blackpool. (0253) 27703. 'Free five year guarantee on all systems. Buy with confidence'. BADA MEMBER

PRACTICAL HI-FI, 84 Penny St, Lancaster. (0524)39657. '14 days option of exchange available. Buy with confidence'. BADA MEMBER

LEICESTERSHIRE

MARKWELL ELECTRONICS Ltd, 76 Leicester Rd, Wigstone. (0533) 882758. Akai, Celestion, JVC, Hitachi, Marantz, Ortofon, Sansui, Sennheiser, Sony, Toshiba. Open Mon-Sat 9.00-8.00. Free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

SOUND ADVICE, The Sound Factory, Duke St, Loughborough LE11 1ED. (0509) 218254. A&R, Creek, Linn Products, Manticore, Naim Audio, Nakamichi, Nytech, Rega, Revox, Yamaha. Dem facilities: 2 studios-domestic size and furnishings. Appointment required. Open Mon-Sat 9.30-6pm. Free installation, credit facilities available. Credit cards: Access, Barclaycard. Service dept.

LINCOLNSHIRE

YATES & GREENHOUGH, 11-14 Emery Lane, Boston, Lincs PE21 8QA. (0205) 55755. B&W, Castle, Dual, Monitor Audio, Mordaunt Short, Nakamichi, QED, Quad, Technics, Yamaha. Dem facilities available. Open 9.00-5.30, closed Thurs. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Creditcharge, Visa. Service dept.

LONDON

A.T. LABS, 159 Chase Side, Enfield, Middlesex. (01) 367 3132. Open Mon-Sat 10am-6pm. Two single speaker dem rooms. Amex, Barclaycard, Access. BADA MEMBER

ANALOG AUDIO, 849 High Rd, London N.12. (01) 445 3267. NAD, Denon, Pioneer, Yamaha, Rotel, Sansui, Dual, Thorens, Tannoy, Marantz. Dem facilities available. Open Mon-Sat 9.45-6.00. Free installation, instant credit up to £1,000. Credit cards: Access, Visa. Service dept.

AUDIO T, 190 West End Lane, London NW6. (01) 794 7848.Open Mon-Sat, 10-6.00. Two single speaker dem rooms. Access, Amex, Barclaycard. BADA MEMBER

BARTLETTS HI-FI, 175-177 Holloway Rd, London N.7. (01) 607 2296/607 2148. 'Large range of British & Japanese products available'. 2 bookable single spk.dem. rooms. Service dept. Mail order dept. Export worldwide. Access, Amex, Diners, Visa. BADA MEMBER

BARTLETTS HI-FI, 19 High St North, London E.6. (01) 552 2716. BADA MEMBER

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 10am-7pm closed Thurs. Home trial facilities, free

installation, interest free credit up to £750.00. Credit cards: Access, Visa. Service dept.
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 9-1pm, instant credit up to £1,500. Credit cards: Access, Visa. Service dept.

K.J. LEISURESOUND, 48 Wigmore Street, London W1. (01) 486 8262. Linn, Magneplanar, DNM, Nakamichi, Michell, Celestion, SD Acoustics, Koetsu, Magnum, Goldbug. Dem facilities. Appointment required. Home trial facilities. Open 10-6 Mon-Sat. Free installation. Instant credit. Credit cards: Visa, Access. Service dept available.

MUSICAL IMAGES, 45 High St, Hounslow, Middlesex. (01) 570 7512. A&R, Denon, Dual, Heybrook, Nakamichi, Proton, QED, Quad, Tannoy, Yamaha. Dem facilities, ring for appointment. Open Mon-Sat 9.30am-6.00pm. Free installation, credit facilities. Credit cards: Access, Amex, Barclaycard, Diners. Service dept.

MYERS AUDIO, 6 Central Parade, Hoe St, London E.17. (01) 520 7277/8. Bang & Olufsen, NAD, Nakamichi, Sansui, Technics, Hitachi, Panasonic, A&R, B&W, Mission. Dem facilities one dem room. Open Mon-Sat 10am-6pm. Free installation, instant credit up to £1,000. Credit cards: Access, Visa, Amex, Diners. Service dept.

WRBI HOME DEMONSTRATIONS, 13 St Johns Hill, London SW11 1TN. (01) 228 7126. Alphason, Audiostatic, Beard, Castle, Celestion, Decca, Ear, Elite, Jordan, Pink Triangle. Home demonstrations only. Appointment required. Open Tues-Thurs 10-6pm, Fri 10-7pm, Sat 10-5.30. Home trial facilities, free installation, instant credit up to £1,000. Credit cards: Access, Amex, Diners, Visa.

SUBJECTIVE AUDIO, 2-4 Camden High St, London NW1 0JA. (01) 387 8281. A&R, Burmester, Krell, Magnaplanar, Meridian, Linn, Nakamichi, John Bowers. Dem facilities: 3 single speaker dem rooms, appointment required. 10.00-6.00 Tues-Fri, 9.00-5.00 Sat. Home trial facilities, instant credit up to £10,000. 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 9.00-6.00pm, Sat 9.30-4.00pm. Home trial facilities, free installation, credit facilities available. Credit cards: Access, American Express, Diners, Visa. Service dept.

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GLOSSARY

AFC: Automatic Frequency Correction; a special circuit that compensates for slight mis-tuning or tuning drift.
AM: Amplitude modulation; a form of radio transmission appropriate nowadays to information rather than hi-fi music (see *MW, LW, SW*).
AM rejection: Ability of an FM tuner to discriminate against unwanted AM interference signals.
Amplitude: Size or magnitude, and hence level or loudness of a signal, for example.
Bandwidth: A range of frequencies with presumed defined upper and lower limits.
'Birdies': A form of FM radio interference, caused by a strong signal near the frequency of a weaker, wanted station.
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.
Capture ratio: The ability of a tuner to reject an unwanted station in favour of a slightly stronger wanted one on the same broadcast frequency.
Clipping: This is the state 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/amplifier matching.
Crosstalk: The leakage from one channel to the other in a two channel stereo system.
dB: See decibel
Decibel (dB): A logarithmic unit of relative loudness, or relative strength of electrical signals. In general use for specifying sound pressure level (SPL), the figure given in **dBA** will be relative to the threshold of hearing. Thus 0dBA is the threshold of hearing, 120dBA the threshold of pain. In equipment tests for noise, hum and rumble, separation etc. the wanted signal is at a level defined as 0dB and the unwanted signal (noise) is quoted as a minus figure, i.e. so many dB below. In these measurements the larger the figure, the better. See also 'weighting'. **dB/W** or 'decibels for one watt' is used to define loudspeaker sensitivity. If one watt is defined as 0dB, amplifier power ratings can be given as **dBW**, for example, 100W = 20dBW.
Decoder: The circuit in a tuner which separates the left and right signals from an FM multiplexed (stereo) transmission.
DIN: German standards body, responsible amongst other things for a popular range of standard plugs and socket specifications.
Distortion: Usually refers to 'total harmonic distortion' which is the percentage of unwanted frequency components (harmonics) present in a wanted signal. Strictly, distortion can mean any unwanted change in the signal, introduced by the equipment.
DX (DX-ing): Code/jargon to describe long-distance radio reception.
Dynamic range: The range between the quietest and loudest sounds which a system or component is capable or reproducing.
Equalisation: The deliberate modification of frequency response, usually in response to some engineering limitation or deficiency in the component (*eg* loudspeakers) or the information medium (*eg* disc and tape).
Farad (F): Unit of capacitance.
FM: Frequency modulation; the technique used to encode audio information for transmission with good fidelity using very high frequency (VHF) transmission.
Ferrite rod: A short rod type aerial used for AM reception; may be fitted internally or externally to tuner or receiver.
Filter: A circuit (normally) used to restrict the bandwidth of a system; may be fixed or switchable.
Frequency: The rate of a cyclic (repeated) vibration.
Frequency response: Abbreviated from amplitude/frequency response, this prime graphical measurement examines whether all frequencies across the spectrum are reproduced or generated at the same relative level.
Harmonic distortion: The addition of unwanted harmonics to a signal. Because the structure of music is already rich in harmonics, the audible effects of moderate levels of harmonic distortion are rarely objectionable, but may be evidence of engineering limitations.
Hertz (Hz): Unit of frequency; 1Hz equals one cycle per second, 1kHz one thousand cycles per second.
Hum: Self explanatory and onomatopoeic; caused by interference of mains frequency or harmonics (50Hz etc in UK), perhaps as a result

of poor earthing arrangements.

IHF: American Institute of High Fidelity, and important standards body, many of whose recommendations on measurement techniques have been adopted in this book.

IM (Intermodulation): Interference between two or more single frequency tones can cause non-harmonic distortion components such as sum, and difference frequency signals to occur.

Impedance: The measure of an electrical load when using alternating currents as in audio, combining resistance, capacitance and inductance.

Jack plug/socket: Post Office style plug/socket standard, widely used for headphone and microphone connections both in mono and stereo formats.

Kilo- (k-): Prefix for units meaning $\times 1000$ (*eg* 1kHz = 1000Hz).

LED: Light Emitting Diode; an indicator light.

LF: Low frequencies; the bass end of the audio frequency range.

Load or Loading: The impedance (including resistive and reactive components) seen by one component looking back to its interconnected component; of importance in compatibility of cartridge/amp and amp/speaker.

'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.

Medium wave: An AM transmission band incapable of high fidelity signals.

Micro- (μ): Prefix for units meaning one millionth of (*eg* seconds, Farads).

Midrange: The middle part of the audio frequency band.

Milli- (m): Prefix for units meaning one thousandth of (*eg* volts, etc.).

Moving-coil (mc): Type of transducer, used in some cartridges and widely in loudspeaker drive units.

Moving-magnet (mm): Type of transducer widely used in cartridges.

Multi-element aerial: FM aerial consisting of dipole *plus* one or more additional elements (called director and reflectors). This sort of aerial is more directional than an FM dipole and provides signal gain in the forward direction. Useful for discriminating against interfering signals and for 'boosting' weak signals.

Muting: In FM tuners, circuit technique which mutes the audio section while tuning between stations thereby eliminating the loud inter-station hiss.

Muting threshold: Threshold point at which the muting is released. This should not be above weak stations otherwise these will not be received. It should be above very weak stations, however, because the background noise on these makes them unsuitable for listening to. Some tuners are equipped with adjustable or switchable threshold level.

Noise: Random unwanted low level signals generated fundamentally through thermal excitation on the molecular level. Poor system design may make it intrusive.

Ohm: (also *eg* kohm): measure of the load presented by a device to an electrical source.

Phono: The most commonly-used plug/socket combination in audio components.

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: The upper-midband/lower treble part of the frequency spectrum, emphasised by frequency response characteristics, makes human voice sound more forward — hence the term 'presence band'. Conversely, a dip in frequency response in this area makes the sound appear more distant, irrespective of actual overall volume.

Sensitivity: The amount of signal input required to generate a specified signal level output, or *vice-versa*.

Signal-to-noise, signal/noise, S/N: The difference in total output when an applied signal is removed.

Step-up: A transformer or head amp used to boost or match the output of a moving-coil cartridge to a normal moving-magnet amplifier disc input.

Transducer: Device transforming energy from mechanical to electrical form or *vice-versa*.

Transient: Signal of very short duration.

Volt (V): A measure of the amplitude of a signal.

Watt (W): A measure of electrical power, combining the voltage (amplitude) with the current required to drive the 'motor' of a loudspeaker.

Weighting: Derived from psycho-acoustic or engineering considerations, this is a bias applied to a test method to improve its subjective relevance (hence also *unweighted*).

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