HI-FI CHOICE

SYSTEMS RACKS AND MINIS

The most comprehensive guide to buying complete stereo hi-fi systems ever published

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Over 35 systems tested

HI-FI CHOICE No. 27

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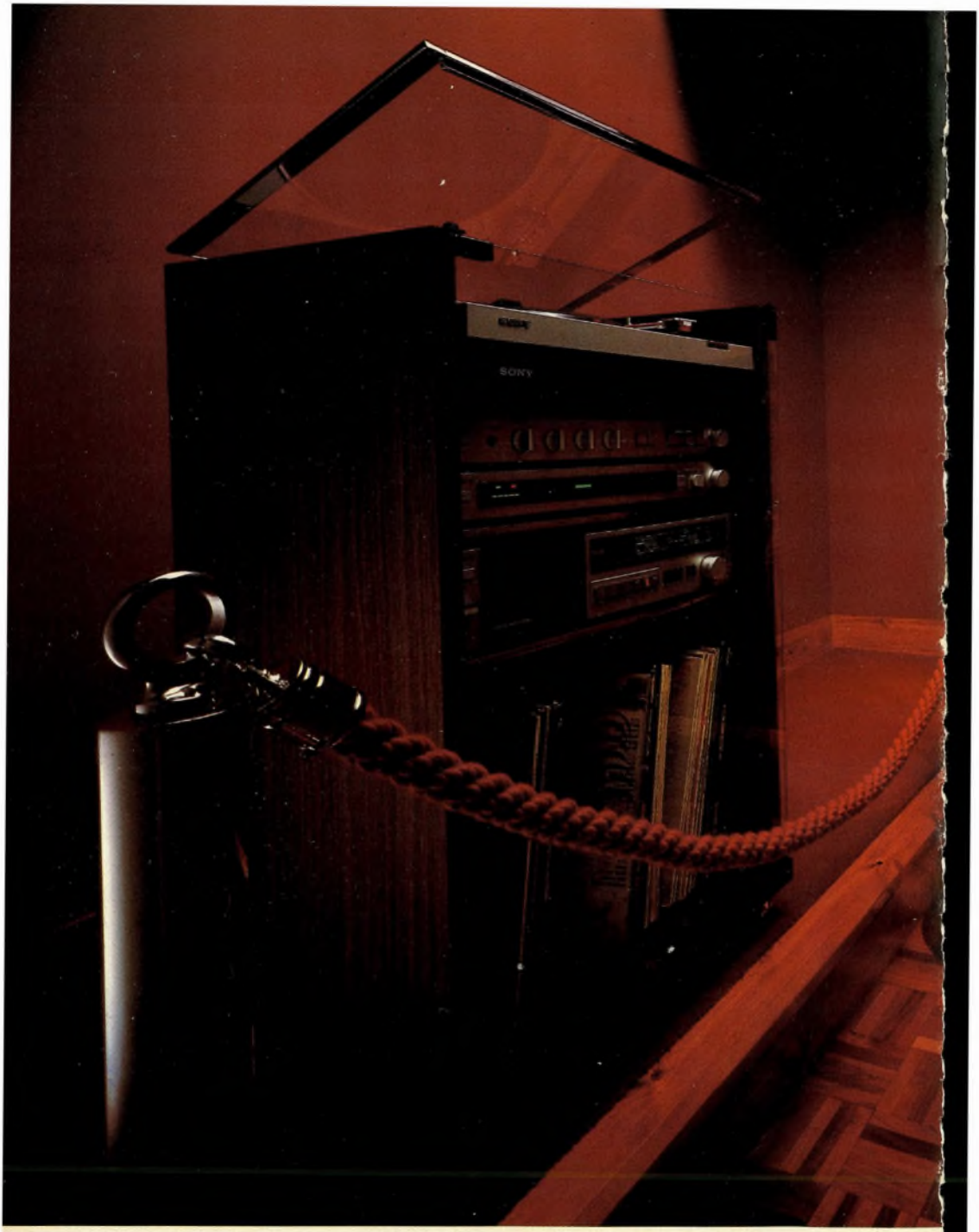

Z1 Price around £460 (inc speakers); Z1 – 'Suffolk' Price around £440 (exc speakers); Z1 – 'Warwick' Price around £500 (exc speakers). Demonstrations from Sony Showroom, 134 Regent

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treet, London W1. Further information Sony (UK) Limited, Pyrene House, Sunbury on Thames, Middlesex TW16 7AT. Dolby noise reduction is the registered trademark of Dolby Labs Inc.

CHOICE HI-FI.

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INTRODUCTION

The Hi-Fi Choice series offers a comprehensive and consistent guide to buying hi-fi. Each edition includes reviews of as many models as possible within a particular product category. This edition, though, is for the buyer who wants to choose a complete system in one go, without the bother of putting together separate units from different manufacturers.

This book aims to tell you all you need to know when you decide to buy a complete hi-fi system, and helps you choose the one which best suits your needs. 'Rack system', 'console system' and 'component system' are some of the names used by manufacturers for their system packages, but all these terms amount basically to the same thing. All integrated hi-fi systems consist of a set of matched hi-fi components which together allow you to play discs, receive radio stations and play cassettes. They will also allow you to record on to cassette from discs or the radio. Usually, systems are supplied complete with a cabinet or rack to house the units, and a suitable pair of speakers. 'Mini' or 'micro' systems aim to do the same job while taking up less space – but in most cases you will need to add a conventional-sized turntable to play discs.

Complete hi-fi systems offer the promise of a genuinely hi-fi standard of sound reproduction – in a convenient, domestically acceptable package. While the size, shape, price and performance of such systems varies widely, the basic components are similar in every case. This introduction looks at the 'building blocks' which make up a hi-fi system.

Amplifier

The amplifier is often described as the heart of a hi-fi system, which is reasonable enough in that all the other components are connected to it and would be of little use without it! The amplifier's job is to take tiny electrical signals – measuring fractions of a volt – from the turntable, tuner or cassette deck and magnify these to a point where they are powerful enough to drive loudspeakers.

All modern amplifiers, then, have input sockets designed to be connected to the outputs of turntables, tuners and tape decks. In addition to these input sockets, there will be a pair of 'tape out' sockets which are used to send the signal from disc or tuner out again to be recorded on cassette. Often there will be two sets of 'tape in' and 'tape out' sockets, which allow you to connect two tape recorders to the amplifier so that you can copy a recording from one machine to the other. In this case there will be a switch marked 'tape dubbing' or 'copy'. This makes things easier if you want to copy tapes on a regular basis, but note that on an amplifier with only one set of tape sockets you can still dub by connecting the output of a second tape recorder to the amplifier's auxiliary ('aux') sockets.

In addition to the usual disc input sockets (usually marked 'phono'), some amplifiers have an additional pair of sockets for moving-coil cartridges. This may be a selling point but is of little interest to those who are buying a complete system package – it will only be needed if you fit your turntable with a moving-coil cartridge of the 'low output' type, and these are relatively expensive and specialist items.

Connections for the speakers – usually spring-loaded terminals but sometimes special two-pin 'DIN' sockets – are also provided on the back of the amplifier. Many amplifiers have provision for two sets of speakers which can be run together. If you want to run two pairs of speakers together, you should bear in mind that the available power from the amplifier will be shared between them, and make sure that the amplifier will not 'run out of steam'.

Output power meters are a common feature of modern amplifiers. Usually they consist of a segmented display of LEDs, which indicate the power in watts being fed to the speakers. Though they can look pretty as they flash along with the music, output power meters do not serve any practical purpose in normal domestic use.

Tuner

A hi-fi tuner is essentially a radio receiver minus the amplifier and loudspeaker. However, most of the tuners reviewed in this book are much more sophisticated than the equivalent parts of the portable radio. For a start, stereo reception on FM requires much more complex circuitry than mono.

When it comes to quality of reception, even quite inexpensive hi-fi tuners are capable of astonishingly good results given a well-produced radio broadcast. It is still true to say that a live classical music broadcast on Radio 3 can give you truer fidelity than any disc on almost any disc playing system. The only proviso here is that a tuner is only as good as the signal it is trying to receive, and this means that in many areas you will need an outdoor or loft aerial to get a high standard of stereo sound without audible hiss. The signal strength required for FM mono is a fraction of that needed for stereo, though, so in practice most people will get away with the indoor

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wire dipole supplied with the tuner.

Most of the recent innovations in tuner design have gone into making the things easier to use – and it is here that so-called *digital* tuners score over their conventional or *analogue* counterparts. The most sophisticated type of tuner is the *quartz synthesiser.* Synthesiser tuners do not have a tuning knob or scale, and no fiddling is necessary to tune a station precisely. Instead there are two buttons marked 'up' and 'down', and when you press either of these the tuner will automatically scan the waveband until it finds a station, and precisely tunes in.

So the synthesiser tuner, if the controls are well designed, makes tuning into the radio just about as easy as it can be. All synthesiser tuners have a digital readout of frequency instead of the conventional scale and pointer – but not all 'digital' tuners are actually synthesiser tuners!

Some tuners have a digital readout for frequency but do not have the capability of finding, locking on to and memorising station frequencies. These less sophisticated digital tuners, then, are not really much easier to use than the conventional scale-and-pointer types.

On the back of a tuner you will usually find a short ferrite-rod aerial for AM reception, which is of course mono only. Most tuners sold in the UK offer medium-wave and long-wave AM reception, but the restricted frequency response of AM broadcasts means that the sound quality you get will be much inferior to FM irrespective of the quality of the tuner.

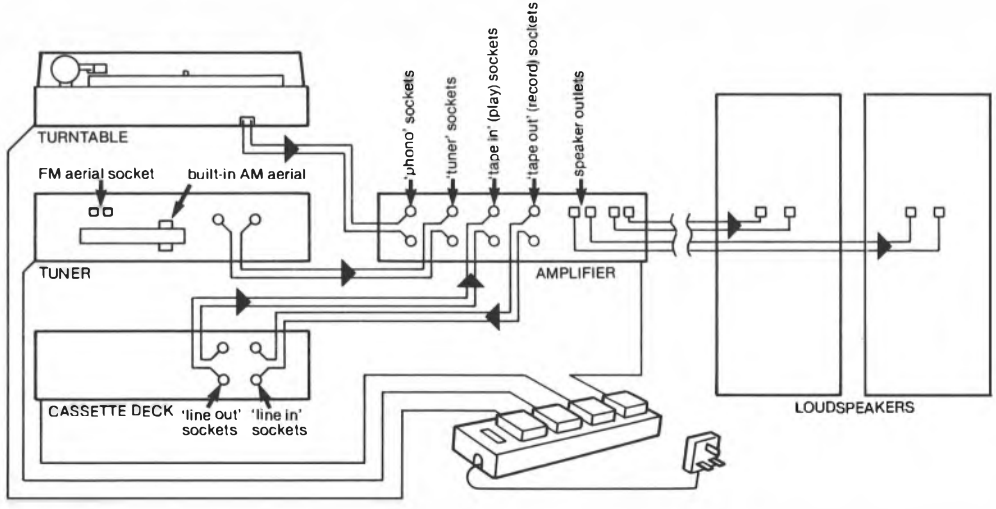
In some systems, you will find that the tuner and amplifier are combined as a single unit, known most logically as a 'tuner-amplifier' but perhaps more universally now as a 'receiver'.

Turntable

As the only part of a modern hi-fi system which is still recognisable from the days of the radiogram, the turntable's function appears obvious. But the turntable unit supplied as part of a complete hi-fi system today is a more sophisticated device than the autochangers found in cheaper 'audio' equipment, even though it will only handle one disc at a time!

Virtually all the turntables reviewed are automatic or semi-automatic. A fully-automatic deck will lift the arm and place it on the record at the touch of a button, and automatically return it to its rest at the end of a side. With a semi-auto deck you need to lift the arm and place it over the first groove of the record, but doing this will automatically start the platter revolving. Semi-auto decks will also lift the arm automatically at the end of the side and return it to its rest.

Though the cartridge is the smallest com-



How a complete system is connected up. In practice the amplifier will be stacked with the other units. The connecting leads between the units are pairs for left and right channels, and are always supplied with the units. Tuners are usually supplied with a suitable wire indoor aerial to be run up to a picture rail. Dealers will supply a suitable mains distribution box and help you with wiring up.

If everything were perfect...

It is rarely necessary to have to boost the bass response of a top quality high fidelity system, (although the Quad 44 tilt control does enable subtle changes to be made to the overall balance of the programme), but there are a number of high quality loudspeakers on the market, which because of their Lilliputian dimensions, necessarily have attenuated low frequency response and the Quad 44 is fitted with a bass control which in the lift position provides optimum equalisation.

Considerations of domestic harmony frequently dictate loudspeaker placement that is less than ideal. The almost inevitable result is the excitation of the fundamental eigentones of the room and music reproduction with a characteristic and unpleasant honk.

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QUAD

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ponent in the hi-fi chain its performance has an enormous effect on sound quality. Manufacturers who want to offer an attractive turntable package at a competitive price will often include only a very cheap cartridge in order to do so. In many cases the sound of a system is let down badly by the cartridge and can be improved dramatically by fitting a better alternative.

Small cyclical variations in the speed of the turntable's rotation are heard as changes in musical pitch. Slow variations are called *wow* while faster ones are called *flutter.* It is generally held that wow and flutter amounting to a change in pitch of less than about 0.15 per cent are likely to go unnoticed, but the amount of wow or flutter which is needed to cause annoyance will vary from person to person – people with musical training are likely to be more susceptible. Even the cheapest hi-fi record decks should perform acceptably in this respect, though our measurements showed some to be very much better than others.

The turntable plinth, motor and platter may appear to be inert parts of the system in that they should not have any effect on sound quality, provided that the record keeps going round at exactly the right speed. But the mechanical characteristics of these supposedly passive parts of the turntable can have their effect on the perceived sound quality too. The faithfulness with which the stylus traces the microscopic undulations in the record groove can be upset by spurious vibrations transmitted to the plinth by the motor or through the air from a nearby loudspeaker. Possible results include loss of musical detail in the sound, emphasis of certain frequencies or suppression of others, boomy or woolly-sounding bass notes and unsatisfactorily muddled 'positioning' of instruments in the stereo sound image.

A turntable's performance in this respect is subtly affected by the way it is mounted – most turntables will, for instance, sound better placed on a solid wall-mounted shelf than on a flimsy coffee table. So for the listening tests in our review programme, each turntable was used in, or on, its rack as the manufacturer intended.

Cassette deck

With a good cassette deck and using a good grade of tape, you should be able to make recordings from radio or disc that are not very significantly inferior to the original. Hi-fi cassette decks also have a pair of microphone sockets for making live recordings, and one or two also have a 'mic mixing' control, which allows to record your voice over a musical track like a radio DJ. This feature appears to be very popular among young buyers in Japan, if not in this country!

The design of the mechanical parts of cassette decks varies enormously despite the standardisation imposed by the dimensions of the Compact Cassette itself. Quality of engineering in the tape transport mechanism is all-important to sound quality and especially to speed stability, and from the manufacturers' point of view, precision mechanics add more to the cost of a unit than electronic gadgetry. So while a good budget deck can produce a performance which is entirely adequate in the context of a complete package system, you need to spend a lot more on a cassette deck to get the best from the cassette medium. Above the 'budget' price level, there are many cassette decks which include extra features or facilities but do not have very much better mechanics than their budget counterparts.

But even with less expensive decks, manufacturers have made great efforts to make cassette deck controls easier and more convenient to use. In many cases the heavy mechanical 'piano key' levers for play, record, rewind and pause have been replaced by buttons which only need a touch of a finger. Another feature which can make life easier is 'cue and review'. On a machine with this facility, pressing the fast-forward button while the machine is in the 'play' mode sends the machine into fast-forward but still allows sound to come through – so you can find the end of a particular track by listening for a break in the speeded-up 'monkey chatter'. This is 'cue' – 'review' is the same thing applied to fast rewind.

In fact the difficulty of finding your place quickly in a tape is just about the biggest practical disadvantage the cassette has against disc, and manufacturers have invented all sorts of devices in efforts to overcome it – efforts also applied to videocassette recorders incidentally! One simple but quite effective idea is to make the recorder able to detect silences between tracks while fast winding and stop when it comes to one.

Aside from the controls which start and stop the tape, most of the knobs, switches and flashing lights on the front of a cassette deck are there to help you set the machine correctly to record. To make a good recording you have to use the record level control in conjunction with the record level meters (usually known as VU meters). If the record level is too high, the tape will be overloaded and on playback will sound obviously distorted. If the record level is too low, there will be an unacceptable amount of hiss on playback.

All hi-fi cassette decks now have switches

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marked *bias* and *equalisation* which will set the machine to match the electromagnetic characteristics of three different kinds of tape – ferric, chrome (or pseudo-chrome, high-bias ferric, superferric or doped ferric), and metal particle tapes. If you record with these switches in the wrong position you will get too much or too little treble, and more distortion. Things are complicated by the fact that different brands of tape in any of these three categories will themselves have different electrical requirements, so any one machine will only give of its best on a limited range of tapes. Again, this point is thoroughly covered in the reviews and suitable recommendations given for each system.

Loudspeakers

The loudspeakers are the final link in the hi-fi chain and have the job of translating the electrical currents fed into them by the amplifier back into mechanical form – changes of air pressure which we hear as sound. The cone of a loudspeaker, then, vibrates back and forth to produce these fluctuations of pressure, driven by a coil-and-magnet arrangement which is in effect a type of electric motor.

Apart from the fact that hi-fi speakers come in pairs for stereo, the real difference between a hi-fi speaker enclosure and the speaker in, say, a transistor radio, is that the hi-fi loudspeaker contains two or more separate *drive units,* or actual speakers. To produce very deep bass notes, the speakers must move large quantities of air – so the bass unit or *woofer* will have a cone of large surface area. Up to a point, the bigger the bass unit is, the deeper the note it will be able to produce. On the other hand, to reproduce high notes, the moving element must be able to vibrate very rapidly – so the treble unit or *tweeter* will have a small, light moving element. In a two-way loudspeaker, then, the electrical signal coming from the amplifier is split into bass and treble frequencies, and these parts of the signal are fed to the appropriate drive unit. This allows the speaker as a whole to reproduce higher and lower frequencies than can be got out of a single drive unit, and to do so with less distortion.

In practice the bigger of the two units in a two-way speaker enclosure handles the middle part of the frequency range as well as the bass notes, hence the term *bass/midrange unit.*

In a three-way (or three-unit) speaker, a separate unit, smaller than the bass unit but bigger than the tweeter, is added to handle the mid frequencies. In theory this ought to be an advantage, but reviewing experience has shown that a good two-way speaker will usually sound better than three-way speakers at the same price or even costing more. This may seem surprising, but if you are looking at speakers built down to a particular price, you will see that in a three-way speaker costs have to be cut both on the drive units and the crossover – and in any case it is much more difficult to design a crossover which will match three units together than one which caters for two.

For the same sort of reasons, the largest speaker at a particular price in not likely to be the best in hi-fi terms. Again, if the manufacturer is designing a speaker to sell at a particular price, the cost of a large cabinet will mean that he has to save money by using cheaper drive units.

Unfortunately, it has to be said that many manufacturers find that the best way to sell speakers at a given price is to make them as big as possible with as many drive units in them as possible. This approach does not make for the best sound quality!

Most of the systems reviewed in this book are supplied with speakers, but in most cases you can buy the package without the speakers and choose your own from another manufacturer. This may seem an unnecessary inconvenience, but in many cases is well worth doing. Suggestions on suitable speakers for systems supplied without are given in the reviews.

Hi-fi standards

In this introduction I have avoided trying to define the term 'high fidelity' or to go into theoretical and technical considerations which designers must take into account when trying to achieve it. There is no broadly accepted definition of what is hi-fi and what is not – except to say that hi-fi aims, as the term itself suggests, for the greatest possible fidelity to the original sound.

In reality, the question when buying equipment is really 'will it satisfy my needs?'. When it comes to sound quality, this really means finding equipment which will allow you and encourage you to sit down and listen to music in a relaxed and enjoyableway – in fact, to forget about the equipment itself. This is fundamentally what hi-fi should be about, and what we looked for in our review programme. Too many so-called hi-fi systems are actually not enjoyable to listen to, even though they may possess what in hi-fi jargon is called 'detail', 'transient attack', 'extended bass' 'clean treble' or whatever. We hope that this book will help you avoid the myths and mysteries of hi-fi and choose a system which will give you as much musical enjoyment as possible.

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('81 AUDIO TEST REPORTS' MARCH 1981)

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('AUDIO VISIONE' MARCH 1980)

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('HIFI STÉRÉO' APRIL 1980)

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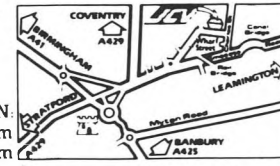

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GUIDE TO REVIEWS

Each system reviewed in this book was subjected both to laboratory measurement tests and to critical listening tests. Here Noel Keywood explains the purpose and relevance of his technical tests while David Prakel describes the listening test programme.

Performance measurements on disc, radio and tape were all carried out through the system's amplifier so as to give a true picture of the way the equipment will behave in actual use.

Flat frequency response is the most basic criterion for high-fidelity, and is shown in the graphs. A flat frequency response simply means that all musical notes, from the lowest to the highest, will be reproduced equally to avoid unnatural emphases. Ideally, the trace on a frequency response graph should be a straight horizontal line that stays within the white area at least between 40Hz and 10kHz – the range of frequencies in which most musical sounds lie, and to which the ear is most sensitive. If the trace moves into the light grey area on our graphs, the effect will be audible, though it may not be annoying. If the trace moves into the dark grey area within the 'bass', 'midrange' or 'treble' regions, then the effect will be very audible and the performance will be considered poor by hi-fi standards. Only at the frequency extremes – above 10 kHz and below 40 kHz – is such deviation tolerable within the context of high fidelity. However, severe peaks in response between 10 kHz and 20 kHz cause a nasty sharp-sounding treble and emphasise distortion. A dip in this region will noticeably dull the sound of percussion instruments such as cymbals and triangles.

Other technical criteria used to define good sound quality are low *distortion*, low *noise*, adequate *separation* between the two stereo channels and – on disc and cassette – correct speed and freedom from speed variations, to ensure correct musical pitch and freedom from audible wavering of pitch. Also important are other specific factors, such as cartridge *tracking* performance, which are covered here under relevant headings, disc, radio and tape.

Disc measurements

On a record deck the musical signal is generated by the *pickup cartridge* which is attached to the end of the *pickup arm*, also called *tonearm*. This cartridge, which carries what a lot of people still call the 'the needle' but is now termed the *stylus*, is a separately purchasable item in a conventional hi-fi system. On rack systems however, the cartridge is usually supplied already fitted and, more often than not, proves to be of very poor quality. A poor cartridge doesn't just produce a bad sound, it *mistracks* the record groove and damages it, introducing permanent distortion.

The disc response graphs clearly show that cheap rack system cartridges often suffer severe falling treble, which makes them sound dull, lacking in detail and sometimes bass heavy. Replacing the cartridge in most of the rack system decks would result in significantly improved sound quality and less record damage. We recommend Nagaoka MP11 or Glanz MFG-11T budget types, which cost between £12-£15. Frequency response of the Glanz is shown in the graph. Either of these cartridges will also give better tracking performance and lower distortion than most.

The record decks of the more expensive rack systems were fitted with attention-catching devices such as illuminated stroboscopes, direct drive motors and lights, but often they did not possess either pickup arms or cartridges better than those seen on the decks of the cheap systems — the Marantz 350, Sansui 9900, Sony S80 and Trio 70X systems were all examples of this. This is forsaking fidelity for the appearance of fidelity. Ignore lights and gimmicks. The expensive rack systems were poor value because of this sort of thing.

Points to look for in the construction of a record deck are as follows. The plinth should be solid. Heavy wooden plinths, now never seen on budget record decks, are better than the lightweight plastic mouldings that are now so common. Ideally, there should be a floating suspension system to isolate the unit from shocks and feedback. The arm should be very rigid, which excludes plastic headshells for example. Arm bearings must allow free movement, but not by introducing excessive slack or free play. Balance the arm out and check this be seeing if it floats freely.

Unfortunately, most rack systems decks are made by just a few Japanese sub-contractors and this is one reason why they are so alike, even in their faults. The production techniques used are also directed to achieve best appearance and perceived value together with low production costs. Fidelity does not appear to be of major concern to the designers.

Amplifier shortcomings can in many cases be responsible for poor disc frequency response, as will be seen from the graphs. When discs are

recorded, they are given a treble emphasis in accordance with a precise frequency response characteristic known as *RIAA equalisation.* The amplifier's disc input stage has the job of correcting this equalisation to produce an overall flat response. However, many of the amplifiers tested introduced frequency imbalances due to inaccurate RIAA correction, usually falling bass response. Some amplifiers had a more serious disc-input stage problem of excessive *input capacitance*, which affects treble response of the cartridge. Worst in this respect were the Trio KA-70, with 500pF capacitance, Rotel A-400 with 320pF and the small Aurex SB-A10 with 240pF (and an input impedance 19% too low). All three amplifiers seriously affected cartridge frequency response and hence sound quality – but fortunately it is possible to get around this problem with a low impedance cartridge. All Glanz and Grado models are suitable in this respect, robust models like the Glanz MFG11T and the low-compliance Grados being most suitable for rack system decks.

Radio measurements

Performance of rack system tuners was, on the whole, of a high standard – largely due to widespread use of integrated circuits, or 'silicon chips'.

Two types of tuner are available. Most common are conventional, manually-tuned designs, with their large tuning knob and dial scale. More sophisticated are push-button synthesiser tuners, fitted with a digital frequency display. These are found in expensive rack systems and mini systems, where the tuner fascia is too small for a clear tuning scale. The only positive identification of a synthesiser tuner is the word 'synthesiser' printed on the fascia. It is possible to get non-synthesiser types with push-button tuning and digital frequency readout.

Push-button tuners are easier to use and synthesiser types, which electronically tune with extraordinary accuracy, hold a station well due to high stability. Their only great weakness can be the generation of what is termed 'synthesiser noise'. This is a rasping buss produced by the internal digital electronics and was a problem on Technics ST-C04 Mini Serie tuner. Excessive noise from this or other sources will be most noticeable when listening either to classical music on Radio 3, where electronic compression is not used on broadcasts, or to live speech programmes.

A synthesiser tuner does not guarantee better sound quality. Although sound quality is affected by tune accuracy, it is also a function of many other factors.

The amount of noise, or hiss, produced by a VHF/FM tuner is determined by the strength of the aerial signal and for noise to reach a minimum, a lot of signal is required. Simple indoor aerials of the type supplied with these rack systems are inadequate, unless you live right under a transmitter. They usually deliver around one tenth of the signal needed, or about 100uV instead of 1000uV (uV = one millionth of a volt). The level of signal needed for minimum noise is quoted in the test results.

Signal-strength indicators are not a reliable guide to the adequacy of the aerial. Many indicate maximum ridiculously low levels, as you can see from the test results – compare the meter readings with the quoted 'minimum noise' aerial signal.

The *sensitivity* values state the minimum aerial signal required to achieve a certain noise level behind broadcasts. This noise level is audible but not intrusive – roughly the same as cassette hiss, without Dolby.

The *selectivity* of a tuner refers to its ability to discriminate between closely-spaced stations without suffering interference. A figure of 60dB or more is usually adequate when receiving local stations.

Cassette measurements

Cassette decks cannot provide sound quality to match the best achieved by tuner or disc. Wide variations in performance exist between decks too – amongst the rack systems on test, some provided respectable sound quality, whilst others were abominable. If you intend to make full use of cassette, both to replay commercially recorded tapes and to record your own, tread carefully.

These two roles of replaying pre-recorded commercial cassettes and recording your own present quite different technicals problems to a cassette deck. To replay commerical recordings successfully, a deck must accord precisely with international standards to ensure a match with the characteristics of the recording equipment. To record on to a blank cassette and then replay successfully, a deck only has to match itself. If the deck runs fast, for example, commerical recordings will have their pitch raised. Many of the decks we tested did display significant speed errors of 1% or more. But this doesn't matter if the deck is only to be used for home

recording, because replay will be at the speed as the recording and pitch will then remain unaltered. Recordings made on other decks won't sound correct of course.

Again, to replay pre-recorded cassettes properly, replay response and the tape head must be perfectly upright (that is the *azimuth* adjustment must be correct), to prevent treble loss. These factors are not of consequence when recording and replaying tapes though. Instead tape matching becomes important.

Manufacturers now quote suitable tapes for their machines but the lists are usually far too general. For example TDK D, OD and AD ferric tapes are commonly listed together, but they are different from each other and without adjustment, one machine cannot be compatible with them all. Our tests determined the most compatible *ferric, chrome* and *metal* tapes from amongst those recommended by a manufacturer. These were then used for testing on the appropriate switch settings.

Ferric tapes are cheap and modern types can provide excellent results. Chrome tapes, or 'pseudo chromes' like TDK SA and Maxell UDXLII are now more common, cost more but will accept higher treble levels before distortion occurs. They produce less hiss too. Among the chrome tapes, a new sub-category of super-chromes is now emerging, BASF Super-chromdioxid II and TDK SA-X being the first examples. Now they are joined by Maxell UDXLII-S and Sony UCX-S. These tapes are not compatible with many of the decks are tested. TDK SA-X does, like its competitors, nearly match the performance of metal tape but incompatibility causes excessive treble. It needs higher bias than TDK SA and most decks must be re-adjusted to suit it. This is the case with the other super-chromes too.

Metal tape accepts the highest treble levels but it is expensive and suffers slightly more noise than chromes, unless recording level is increased. Scotch Metafine is an exception in this respect. Metal tapes are very similar to each other in their characteristics.

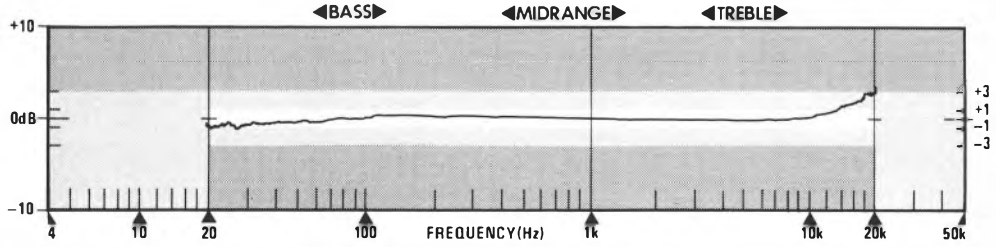
Finally, dual-layer *ferrichrome* tapes are still available from Scotch, Sony and BASF. They have never become very popular, because of early problems perhaps, but can give good results if a deck has been set up properly to suit them. However, it seems that few decks are these days and so we have ignored ferrichromes.

If a tape is incompatible with a deck, it will sound either over-bright or dull. It is then possible to guess which other tape brand or type will be compatible, without going out and buying everything on the market. For example, if TDK SA sounds over-bright, then Maxwell UDXLII or Scotch Master II will probably sound correct. But if TDK SA sounded dull, TDK SA-X or BASF Superchromdioxid II would probably give better results. Their relative placings are determined by their bias requirements and the short table provided here shows how to guess, with some accuracy, which tape is most likely to be compatible. It is necessarily limited only to more popular brands and types and relates to frequency response or tonal balance, not other factors.

Amplifier and loudspeaker tests

A power output of around 25 watts per channel is about the minimum needed for reasonable volume from a hi-fi system and on test the rack system amplifiers all met or exceeded this requirement. Because of the way we hear, it takes a large increase in power to produce significant change in volume and so the necessary amplifier output spirals upward quickly when high volumes are needed.

The volume a system can produce is also determined by the loudspeakers' *efficiency* or *sensitivity* – the amount of sound it can



Disc response from the Glanz MFG11T via the Trio KA-70 amplifier, which has a high input capacitance. Shows that, unlike most cartridges, the low-inductance type Glanz models are not affected by the amplifier characteristic.

The JVC guide to accurate recording made easy.

In their efforts to make recording and play-back on the KD-D4 cassette deck as simple as possible JVC's engineers haven't missed a trick. Tape operation is smooth and trouble-free with soft-operating buttons, there's a spectro-peak indicator built in, a music scan system and a multi-function digital counter. No cassette deck at its price can match it.

Listen with your eyes

Finding the right level for recording on most decks is a delicate, difficult and time-consuming task. If you've only got an average reading VU meter to help you, you're doing it the hard way. The most simple, accurate way to set optimum recording levels is to use a spectro-peak indicator. Naturally the KD-D4 has one. The KD-D4's two colour fluorescent spectro-peak indicator has five bars to show peak levels over a wide range (from −20 to +9dB) at five frequencies, and in addition there is a VU reading bar for each channel, as well as one peak-reading bar for composite output.

It's comprehensive. It's effective. It's simple.

Right on cue

The KD-D4 has a unique multiple music scan system. With it you can skip up to 20 selections on a cassette to

See how great it sounds...

cue into the one of your choice instantly. It puts an end to the usual frustration of having to run backwards and forwards on a cassette to find exactly the track you want.

Multi-function counter

The digital counter on the KD-D4 is much more than a precision 4-digit electronic tape counter.

Just twist the knob and it works as:

* an elapsed-time counter with a time accumulating function.
* a counter that tells you how much time you have left on a tape in minutes and seconds.
* an indicator for the multiple music scan system.

Brilliant sound

The KD-D4 has a metaperm head and a 2-gap ferrite Erase head so you can take advantage of all the pluses of metal tape cassettes. It has Super ANRS and Dolby B compatible ANRS to bring signal-to-noise ratio down to a minimum while the wow and flutter is just 0.16% (DIN 45,000).

It all adds up to a cassette deck that is a delight and a pleasure to use.

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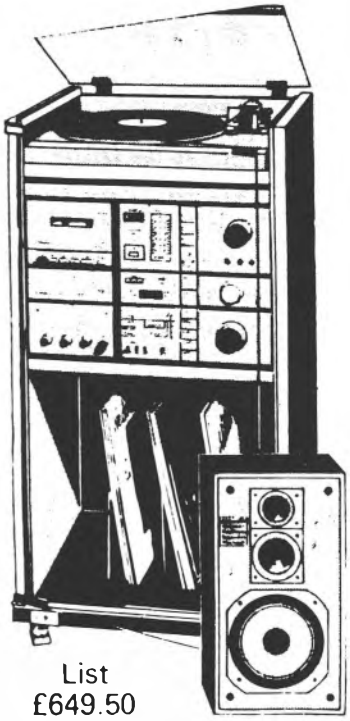

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produce from a given input. Large but simple loudspeakers of the type supplied with the more expensive rack systems are usually more sensitive than their smaller brethren – sensitivity doesn't have to be sacrificed for bass response when using larger bass units and cabinets. So, with the twin advantages of sensitive loudspeakers and more powerful amplifiers, the more expensive rack systems do go much louder, even if they didn't generally provide better fidelity. We have calculated the potential volume levels achievable by the systems, using power output and speaker sensitivity figures. The quoted figures should be taken only as a rough guide though, since there are numerous complicating factors such as loudspeaker distortion and power handling characteristics. Note that a difference of 3dB in sound pressure level can be taken as subjectively 'twice as loud'.

All tests on the rack system disc, radio and tape sections were, as already stated, carried out through the amplifier, operating under normal conditions. In consequence, test figures and graphs for each section take account of amplifier performance.

NK

Listening test programme

With the technical measurements complete the listening tests were set up. The first task was to build up every rack where appropriate. As it appears that the rack can make a big difference to the feedback performance of any given turntable each turntable was auditioned in place on its rack rather than on the test bench.

On a more mundane level, every rack was unpacked and built as would be done by the customer. At every stage notes were made on the quality and substance of the packing and the amount of preassembly work done for the buyer on hinges, castors and door catches. Instruction sheets, where provided were followed to the letter to find out just how easy or how difficult it would be to build a rack at home – without the benefit we had of previous rack building experience! Once assembled, quality of the materials, style and finish were assessed, and more importantly, the rack's dimensional stability was looked at and commented on once the equipment was installed. Here again some racks were easy to 'load' and some weren't!

Disc listening tests

The turntable in each system was first reviewed in conjunction with the system amplifier but through the 'reference' loudspeakers – a pair of KEF Coda IIs. The 'reference' turntable and amplifier – Dual 505 and NAD 3020 – were always available for comparison.

Three discs were used for the turntable/amp tests each chosen to reveal different aspects of

FERRIC	CHROME	METAL
TDK A	TDK SA-X	TDK MA, Maxell Metaxial, BASF Metal IV, Sony Metallic, Philips Metal, Hitachi ME
TDK OD	BASF Superchromdioxid II	
	Memorex High Bias	
TDK D, Sony AHF, Scotch Master 1, Maxell UDXLI	Maxell UDXLIIS, Sony UCX-S	
	TDK SA, Fuji FXII, SONY CD alpha	
Sony BHF, Philips Ultra Ferro, Maxell UL, Fuji FX1, BASF Super LH1,	BASF Chrom II, Philips Ultra Chrom, Maxell UDXLII	
Sony CHF, Philips Ferro, BASF LH SM	Scotch Master II	Scotch Metafine

MORE TREBLE (high bias)

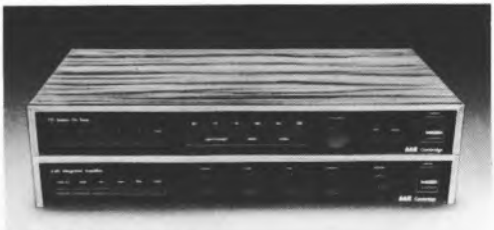
LESS TREBLE (low bias)

Table of popular tape types arranged according to bias requirement. If the tape you are using gives too much treble on your machine, try one from a group further down the table. If you are getting too little treble, move up. This table is only intended as an aid to overcoming tape-to-deck mismatches, and does not indicate the relative merits of the tape types listed.

LINN SONDEK

ORACLE

MERIDIAN



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performance – a wide-dynamic range modern recording of orchestral music made with digital equipment, a cleanly-recorded rock album, and a simply-miked recording of a quintet of wind instruments. The wide-dynamic-range digital recording provided a tracking test, particularly with its complex brass scoring. The tonal quality of the massed brass and strings in this digitally processed material is vivid with a tendency to hardness, and this was helpful in enabling high-frequency peaks in response to be heard distinctly.

The rock music had 'tight' electric bass lines which provided a good test of upper bass definition and effects of (or freedom from) feedback in the turntable. Backing vocals, if well defined, told us that the cartridge could pick out detail and that the amp could reproduce it. The lead voice was useful is assessing cartridge colouration.

The wind quintet recording was produced with what are known are *crossed-pair* microphones (two mono mikes angled together as a stereo pair) which is the simplest and 'purest' means of recording stereo – this kind of recording should produce a deep stereo image with consistent placement of instrumentalists within the image and a strong sense of the recorded acoustic around the players. This disc was helpful in assessing a cartridge's stereo separation, as the higher the figure for separation the more refined or precise the image should be. Frequency imbalance in a cartridge or phono input stage would alter the apparent front-to-back stereo image depth while the flute, oboe, clarinet, horn and bassoon tones enabled rapid detection of colouration or distortion from the cartridge. This record is cut without limiting and provided a stiff test of tracking ability.

Loudspeaker listening tests

As the reference system was in use during this part of the test it seemed sensible to move straight on to listening to the test systems's speakers on the end of the reference disc system (Dual turntable with Nagaoka cartridge and NAD amp). Four test discs were used to assess the loudspeakers' performance. The first was a recently recut version of a vintage 1961 Decca recording made in Geneva with the Orchestra of the Suisse Romande. Though slightly dated in its tonal presentation, this disc has deep bass, fine stereo imaging and a wide dynamic range.

The rock music used this time had female vocals with electric bass, acoustic guitar tightly recorded kick drum and plenty of cymbal crashes. Here we could assess bass overhang in the speakers as well as their lack of colouration in the midband, the smoothness of their treble extension and their 'dynamics'. A French recording of a string quartet playing Beethoven was used to check the midband and treble colouration levels though as this record was made with a simple pair of microphones in a dummy-head type arrangement it gave a wide dynamic range sound with accurate stereo imaging. The crossed-pair miked wind quintet recording was used again in this test to assess the speakers' imaging ability and general colouration.

The rack system disc combination – turntable, amp and speakers – could now be assembled and auditioned as a whole. The pieces for audition were chosen in part from the foregoing tests to establish what changes had been introduced in combining the equipment. Complementary or competing frequency balances could show as a big change in frequency balance from the previous auditioning. The older orchestral disc and male vocal rock music were used. A third record of solo piano was included here which gave good information on the system's ability to cope with detail and musical transients across a wide dynamic range – remember a piano is a true percussion instrument with strings hit by hammers and that the percussive quality or attack of every note even in the deep bass should be heard. A poor turntable could easily jumble up the sound while speakers with overhung bass were quickly spotted by their rounding off of bass notes. This completed the formal assessment of the disc playing system though susceptibility to footfall and general feedback levels through the rack and turntable plinth were now investigated.

Radio listening tests

The tuner and system amp were now connected to a high-quality roof-mounted aerial. The reference tuner was played through the test amplifier's tape 2 or auxiliary sockets and as its output level could be varied a precise level match could be made with the system tuner. Uncompressed speech, generally from BBC Radio 2 chat programmes, was used to assess colouration and distortion levels in the system tuner, relative to the reference tuner on the same aerial. General stereo imaging and colouration was assessed on classical music broadcasts from BBC Radio 3, care being taking to catch as many live broadcasts as possible, rather than

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taped material. Classical music with its wide dynamic range showed up noise in the quiet passages if it were there.

To assess AM medium wave performance, the tuners were then switched to 720kHz on medium wave to receive Radio 4. The system tuners could then be assessed against the reference tuner, which was designed for high quality AM reception.

Cassette listening tests

For the cassette testing stage, each cassette deck was used to tape the first orchestral excerpt and the female-voice rock record, using the reference turntable to play the discs. The orchestral music clearly showed up treble problems and headroom limitations. The female rock track with kick drum showed the cassette deck's low-frequency performance both in 'tightness' and extension. The best matching pseudochrome or chrome tape was chosen for this test to provide conditions that would be likely to be encountered by the buyer, who would be unlikely to use metal tapes for good-quality every day taping.

Next came the tests for replay quality on commercial pre-recorded musicassettes. The two tapes used were chosen for their accurate azimuth (checked on the actual tapes chosen).

The first was a digitally recorded orchestral piece on high quality ferric tape for ferric – equalisation replay. This was recorded with simple microphone techniques and enabled the stereo separation and general colouration and noise levels to be assessed. The rock tape was a £16 super-fidelity taped copied in real time from the original master tape (not duplicated at high speed like normal musicassettes) on to Cr02 tape for chrome – equalisation replay. The deep bass and detail on this tape provided a good test for bass integrity and stable tape transport.

This concluded the listening tests which were conducted in a large furnished room with a shallow bay window along one long wall. The ceilings are high and the speakers were used about 8 feet apart on stout 10 inch high stands infront of the waist high wall of the bay.

The disc reference system listed at the end of this introduction was chosen for its known abilities at a (reasonable) given price rather than for its absolute performance. The reference tuner and cassette deck were chosen as offering the highest standard of domestic reproduction from these sources likely to be encountered – both had output level controls which were essential for level matching between reference and test equipment.

DGP

Euipment used for listening and measuring

Dual CS505 and Garrard B20 turntables (Le Mat by Audioref to replace mat on reference turntable)

Nagaoka MP-11, Glanz MFG-11T and Ortofon FF15E/II cartridges

NAD 3020 amplifier

Pioneer TX 9800 tuner

Aiwa AD 6900 cassette deck

KEF Coda II and Celestion Ditton 100 loudspeakers

QED 79 strand speaker cable

Programme used for stereo listening tests
Disc

Bruckner, Symphony No 4. Chicago SO/Solti (Decca (digital) SXDL 7538).

'Shades' by J J Cale. (Island ILPS 5021)

Neilsen, Quintet for flute, oboe, clarinet, horn and bassoon Op43. Norwegian Wind Quintet (Simax PS 1003).

Rimsky-Korsakov, Scheherazade. L'orchestra de la Suisse Romande/Ansermet (Contour CC 7501).

'Me, Myself, I' by Joan Armatrading (A&M AMLH 64809).

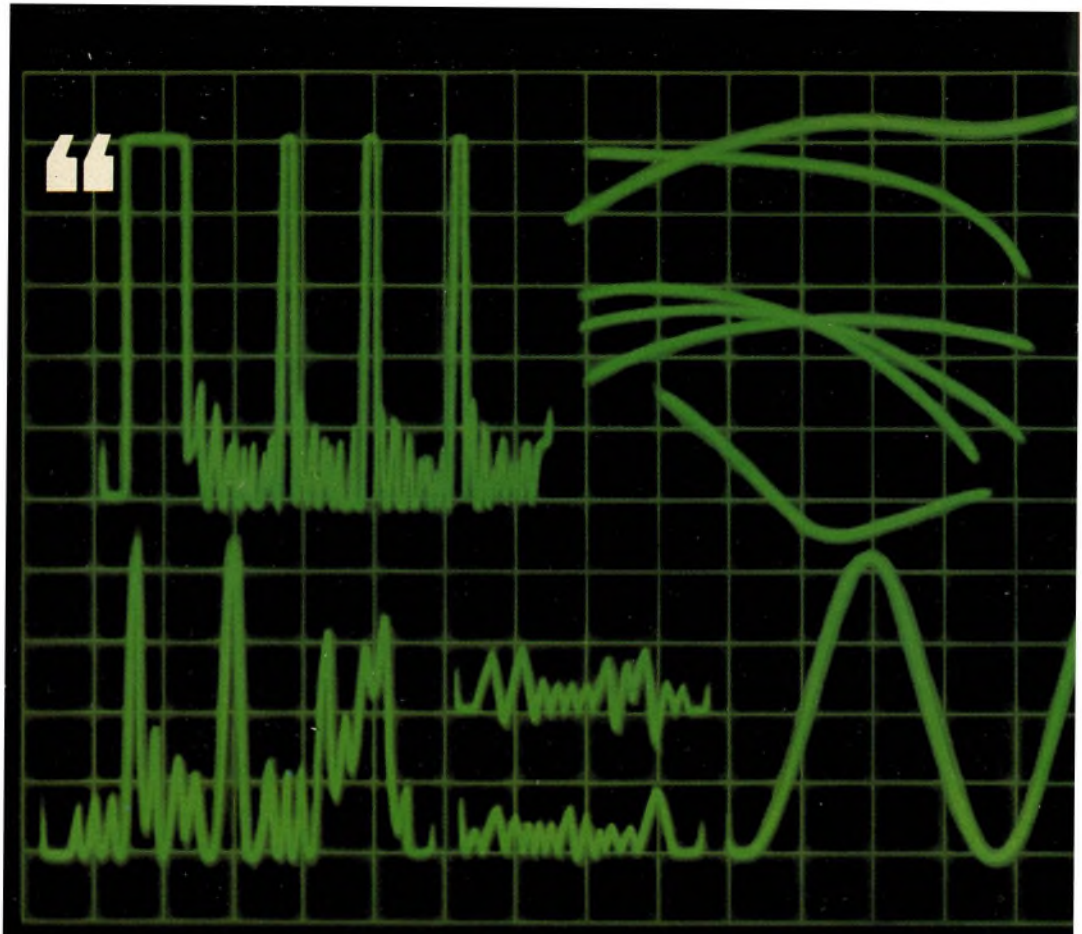
Beethoven, String Quartet No 15 Op132. Talich Quartet (Caliope CAL 1639).

Beethoven, Bagatelles Op33, 119, 126. Stephen Bishop (Philips 6500 930).

Cassette

Debussy, 'Images'. LSO/Previn (EMI TC-ASD 3804, ferric tape).

'Dark Side of the Moon' by Pink Floyd (MFSL C-017, chrome tape).



Angus McKenzie explaining why the new Sony UCX-S is the best

What Angus McKenzie doesn't know about testing tapes, probably isn't worth learning.

Because Angus uses the very latest, computer controlled equipment.

So when he got hold of Sony's UCX-S tape you can bet it got a very thorough going over.

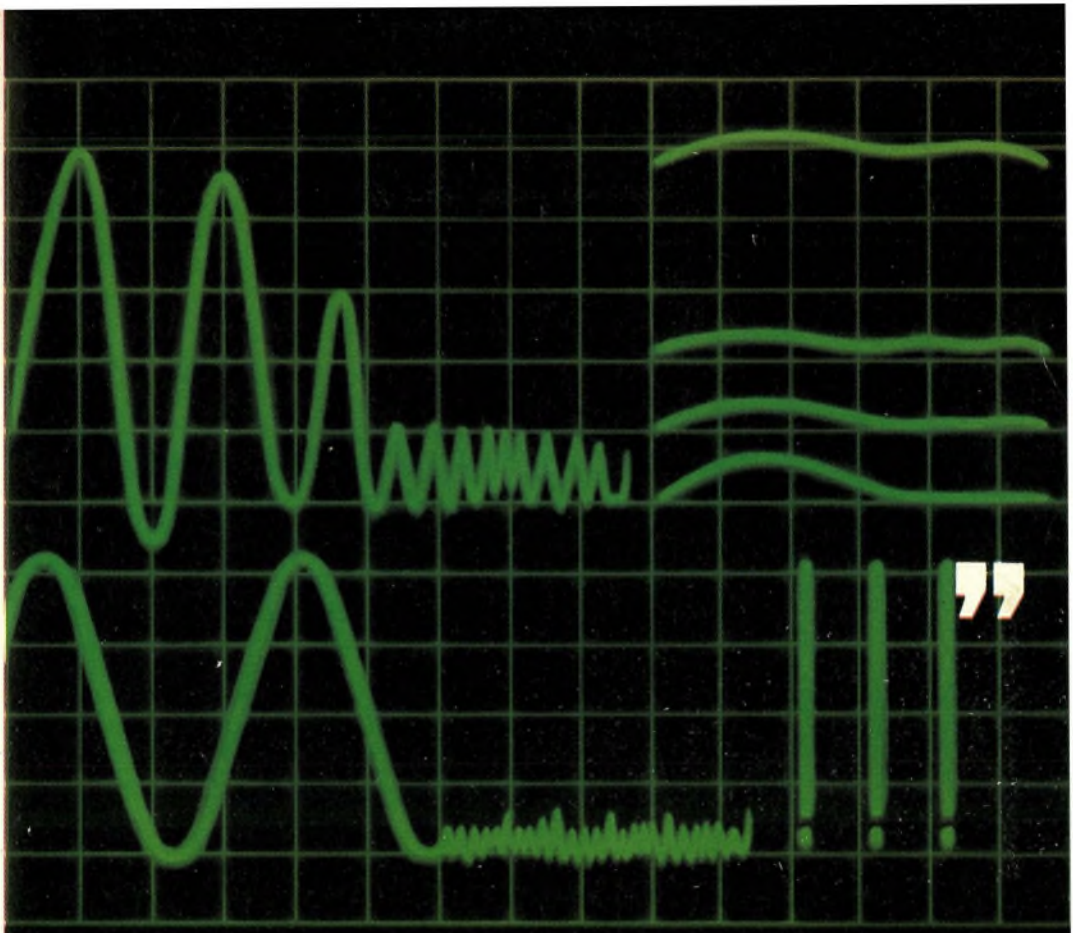
It was the incredibly low print-through of the UCX-S (see first graph) that moved Angus McKenzie to utter words like 'excellent' and even 'amazing'.

And as you may know, print through is becoming vitally important as the new noise reduction systems push the noise floor lower. With Sony's new tape that's no longer a problem.

The bias setting is almost exactly what the IEC says it should be for a type II tape (second graph).

This means Sony's new tape is compatible with many more tape decks than any other high bias type II tape.

The high performance of the UCX-S is largely due to a Sony breakthrough in tape technology. Which has now made it possible to make the micro-fine surface



pseudo-chrome he's ever tested.

particles 30% smaller than on most other tapes.

These particles are also much more evenly distributed on the UCX-S.

And that gives it a much wider dynamic range (third graph). With an MOL of +7.5dB at 315Hz.

Easily the highest of any type II tape.

And to keep it sounding better for longer, Sony has designed the leader tape to be a tape head cleaner as well.

Of course, because it's Sony, it also has the famous SP mechanism, to make sure that it always runs smoothly.

So it's easy to see why Angus McKenzie thinks the UCX-S is the best tape to use if you're concerned about the quality of recording.

We at Sony will refund the price of the tape if the UCX-S doesn't give the best performance of any type II cassette you've ever used.*

But seeing even Angus McKenzie was happy, we don't think we'll have to.

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While Aiwa have never really quite joined the really big-selling Japanese brands in the mass market, their products have always caught attention with innovative design and quality production. The Aiwa RS2S system is a new combination of components and as production of the rack itself was being finalised at the time of our review, we were supplied with a ready-built prototype – so no comments can be made on packing, instructions or ease of assembly. However, the sample rack supplied was a sturdy, excellently-finished unit built around a metal frame with cassette drawer, thick glass work in both sides and door and four LP dividers in the record compartment.

Disc

The Aiwa AP-D35K turntable is a simple belt drive design offering auto arm return only. Speed select and reject buttons are on the front of the plinth, which sits on moulded rubber cones for suspension. The straight-wand type arm incorporates plenty of plastic in the design and the headshell is rather flimsy. On test the motor unit proved good on the hum and rumble measurements though the deck was prone to feedback, probably due to its light weight and vestigal suspension. There was very little hiss from the fitted cartridge when feeding the Aiwa amplifier. The cartridge proved to be an exceptional tracker though unfortunately its performance was spoiled to some extent by the very bad treble peak, shown on the disc frequency response trace. An arm resonance is also noticeable at around 180Hz.

The Aiwa AA-8200K amplifier is a slimline design offering compatibility with both magnetic and moving coil cartridges on the phono input in addition to accepting tuner and auxiliary inputs. Only one set of record/replay sockets are provided for one tape deck though dubbing can be achieved from the auxiliary socket onto tape 1. In addition to conventionally-engineered treble and bass controls, offering 8dB cut or boost at 10kHz and 100Hz respectively, and a loudness control with both treble

and bass boost, the amp features DSL (Dynamic Super Loudness). This is Aiwa's name for a low bass boost to produce deeper bass from small speakers. The DSL did extend the bass of small speakers, with some loss of upper bass control – but on bigger speakers it merely muddled up the low bass. Volume is set by slider while the power meter shows the total power of both channels.

The Aiwa turntable and amplifier were first auditioned through the reference speakers with the orchestral test disc. The treble content of string instruments was dull but there was a very hard 'edge' to the sound. Stereo separation was good though the image was too deep, an effect produced by the lack of level in the presence band above 2kHz. Rock music had a steely bright 'zip' to cymbals and guitar which proved fatiguing, and the same characteristic added a sibilant edge to vocals. The cartridge tracked securely with clear detail but the bass line was a bit 'fluffy'. On the crossed-pair-miked chamber excerpt the presence dip produced an artificially deep or enhanced image. The flute had a piping edge though stereo separation was good and the background silent in comparison with other systems.

Tuner

The Aiwa AT-9500K is a true digitally-synthesised tuner with automatic scanning both up and down on the three wavebands. There are six presets which can memorise one FM and one AM station each. The large window in the centre of the tuner shows the tuned frequency. The signal-strength meter was quite useful as its sensitivities were reasonably well chosen – though the fifth segment lit for an aerial signal of only 320uV, much less than the 1mV signal needed for minimum noise. On the test bench the tuner proved competent in every respect with excellent stereo separation. The tuner too is fitted with three IEC mains sockets and can be remotely operated through the DIN socket on the back panel.

Comparing the Aiwa tuner (through the Aiwa amplifier) with the reference tuner on broadcast speech the Aiwa was only barely distinguishable from the reference by a slight increase in hiss level and some nasal colouration in male voice. On music the Aiwa was slightly hissier than the reference again, but it would be nit-picking to seek out significant differences in sound quality. An excellent performance, then, confirming the text-book frequency response plot and the fine measurements.

Cassette

Neatly styled, the Aiwa AD-3100K cassette deck has touch-sensitive transport controls. In some lights it could prove difficult to read the legends on the perspex face plate. The heads are easily accessible for cleaning while an azimuth adjustment screw is provided (though only for those who know what they are doing or have access to test tapes and equipment). Fine bias adjustment is provided for ferric tape types which gives the machine a wide tape compatibility. Twin ganged record level controls are used, in conjunction with the clear vertically-disposed wide-range LED meters.

On the test bench the AD-3100 produced good results though its high frequency performance was limited in the extreme highs by the operation of an MPX filter. Rather high distortion levels and fast running spoiled an otherwise good test report.

Using TDK SA tape a recording was made on an extract from the orchestral test piece which was then replayed for simultaneous 'A/B' comparison with a second playing of the disc. Replay levels were the same on both disc and tape. In this test the Aiwa showed up a slightly thickened bass quality with some upper bass emphasis in orchestral strings. The slight presence dip in frequency response caused an enhancement of the apparent stereo image size, though the treble content above was evenly emphasised making string tone brighter and brass instruments brassier. The tape was a very good match with the source, however – a far better performance than the majority of machines auditioned in this project.

The rock test disc was taped and compared in the same way, when the electric bass guitar line was felt to be tight but rather rich, and there was some lack of punch or impact in drums off-tape – but the Aiwa proved itself capable of true high-fidelity performance.

Using the ferric-equalisation orchestral pre-recorded tape the replay-only response on the deck was investigated. The sound was very close to that of the reference cassette deck, lacking only the last ounce of bloom or 'airness' in the treble and being both slightly noisier and tonally thicker. The image from the Aiwa was pushed a bit forward by the frequency balance and there was some lack of the recorded ambience from the recording venue which is admirably captured on this commercial tape by the use of simple microphone technique.

The chrome-equalisation pre-recorded rock tape was then tried in comparison with the replay from the reference cassette machine. The Aiwa sounded neat and clear if rather midband-forward. The sound was close to the reference balance, though bass lines from electric bass guitar were rather 'woolly'.

Summary

The Aiwa RS2S system was not supplied with speakers and so was assessed only on the reference speakers, KEF Coda IIs. On test the amplifier produced a good 45 watts into an 8 ohm load and 72 watts into a 4 ohm load, which is a respectable performance into the lower impedance. A perfect amplifier would double the wattage into the halved-impedance load. The amplifier gave a clean, slightly bass light sound when auditioned with the reference equipment.

The AP-D35K turntable was the only real disappointment in the RS2S system, but even so this deck is fitted with one of the best-tracking cartridges tested throughout the whole project. The turntable's feet were just not up to the job of isolating the record/cartridge interface from energy transmitted through the rack from the speakers. At high level replay with bassy speakers, feedback could be a problem, though removing the castors from the rack and siting it near a wall should help. Aiwa should think of improving the turntable which goes with this system, because as it stands the D35 lets the side down to some extent.

The Aiwa tuner and cassette deck gave exceptionally good results, the tuner in particular being barely distinguishable from the reference tuner. With the cassette deck, the fine bias adjustment will allow the user to make the best of a range of ferric tapes too.

The build quality of the equipment and the excellent finish of the rack go towards making recommendation mandatory for this rack despite the turntable's poor showing. At least money isn't wasted with this system on poor speakers, allowing the buyer to choose his own.

AIWA RS2S

DISC (performance via amplifier)

Frequency response	20Hz – 12kHz	above average
Stereo separation	– 29dB	good
Distortion	1.5%	below average
Hum and rumble	– 67dB	very good
Hiss	– 79dB	excellent
Speed variations	0.08%	good
Speed accuracy	0.1% fast	excellent
Tracking ability	25cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	28Hz – 17kHz	very good
Stereo separation	– 46dB	excellent
Distortion	0.24%	good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	1mV	average
Selectivity between stations	85dB	excellent
Sensitivity, mono	2uV	good
Sensitivity, stereo	30uV	average

Signal strength meter levels (1) 2uV (2) 6uV (3) 25uV (4) 100uV (5) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	TDK AD
Chrome tape setting	TDK SA
Metal tape setting	TDK MA

Frequency response, record/replay:

Ferric tape setting	28Hz – 14kHz	above average
Chrome tape setting	28Hz – 14kHz	above average
Metal tape setting	20Hz – 15kHz	good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 10kHz	good
Chrome tape setting	40Hz – 10kHz	good
Stereo separation	– 42dB	very good
Distortion	2.4%	below average

Noise, Dolby in:

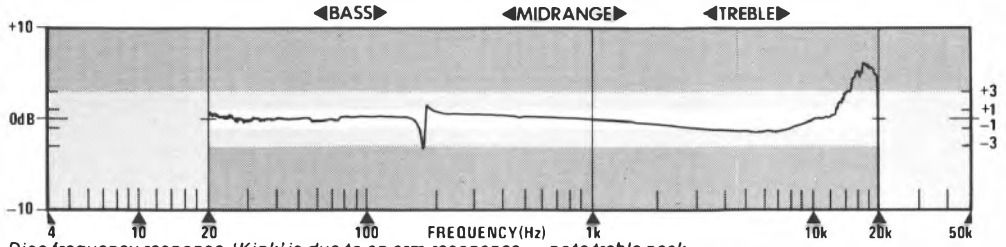
Ferric tape setting	– 61dB	very good
Chrome tape setting	– 62dB	good
Metal tape setting	– 59dB	typical
Speed variations	0.05%	excellent
Speed accuracy	0.8% fast	poor

AMPLIFIER

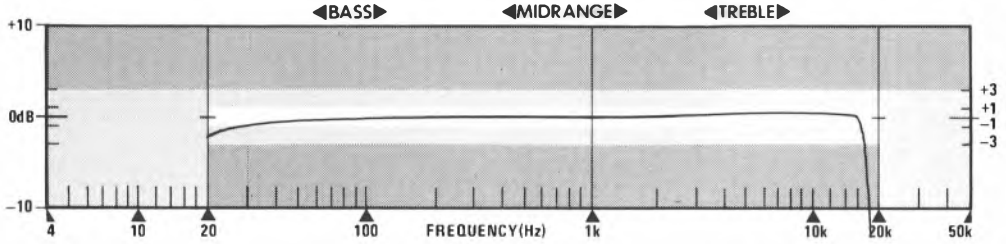
Power output, per channel	45 watts	medium power

GENERAL

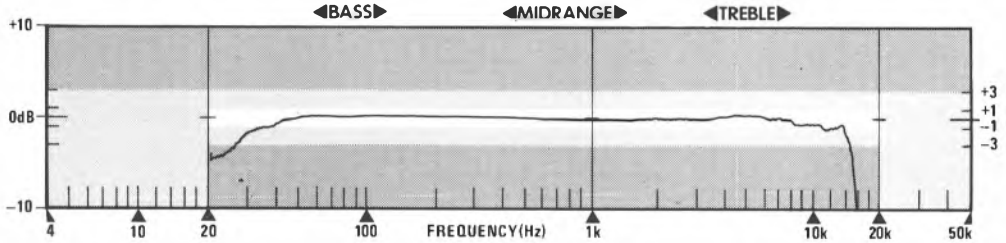
Rack dimensions	89cm x 48cm x 40cm
Price	without speakers, £440



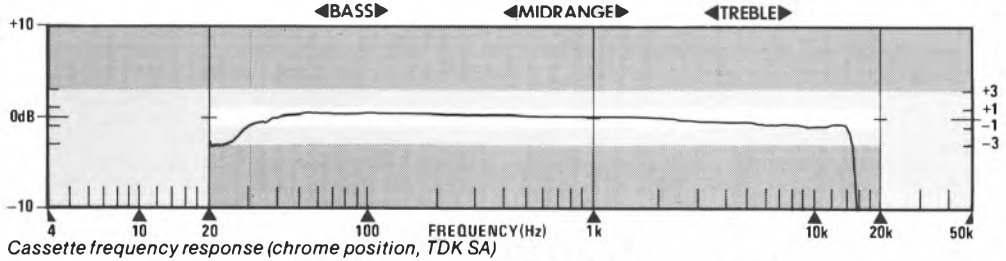
Disc frequency response. 'Kink' is due to an arm resonance — note treble peak



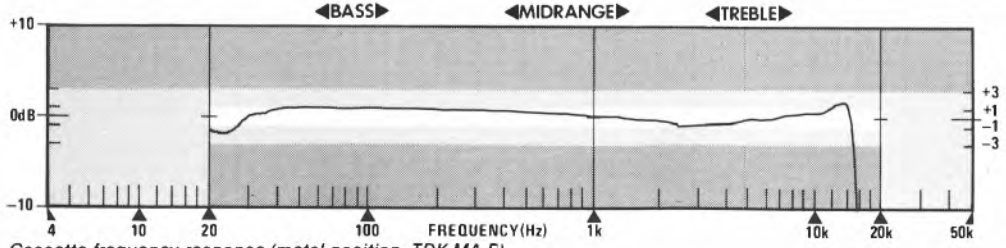
Tuner frequency response, FM. Very good flat response



Cassette frequency response (ferric position, TDK AD)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA-R)

Aiwa 606

Aiwa Sales & Service (UK) Ltd, 30-32 Concord Road, Westwood Park Trading Estate, London W3 0TH
Tel 01-993 1672

Aiwa's miniature system is unusual in that this Japanese-designed equipment is built in the UK – all bar the cassette deck. There is no miniature turntable in the range to match this equipment but Aiwa do recommend their AP-D35K turntable, reviewed as part of the RS2S system. This turntable would put £60 on the price of the 606 system.

No rack is supplied or indeed built to house the Aiwa 606, though such small equipment hardly needs anything more than a corner of a sideboard or shelf.

Disc

The Aiwa D35 turntable supplied to us as part of the Aiwa RS2S system was used as a disc source for the 606 system, as suggested by the manufacturer. The measured results obtained from this deck through the 606 system's SA-A60K amp were almost identical to those produced with the AA-8200K amplifier, which shows there to be no frequency response problems or input loading irregularities.

The Aiwa SA-A60K amplifier is an integrated design, not quite as small as the Aurex integrated model but more powerful. The Aiwa fascia is rather untidily laid out with a central balance control next to a rotary function selector, two vertical switches for tape monitoring and loudness, and the larger volume control. Above these controls in a strip across the fascia are the DSL (Dynamic Super Loudness) switch, low filter and muting switch which are separated from the phono input selector. The A60K can accommodate either moving magnet or moving-coil cartridges on the one switchable phono input, in addition to tuner, tape and auxiliary inputs. Only one pair of speakers can be driven.

Tone controls are conventionally engineered offering 10dB of cut or boost at 100Hz in the bass and 8dB in the treble at 10kHz. The loudness control to compensate for the ear's reduced sensitivity to frequency extremes at low levels offers a sensible 6.5dB bass lift and a 3dB treble lift (at a volume control setting of –40dB

attenuation). The tone circuits are bypassed with the rotary controls in the center zero position. A poor volume control component caused balance changes of up to 2dB according to the volume control setting on the review sample.

The DLS button offers a low frequency bass boost which is intended to compensate for the lack of bass extension when small speakers are used. With the SC-E60 speakers this did produce a greater extension but at the expense of upper-bass clarity.

The Aiwa D35K turntable and A60K amplifier were used to drive the reference speakers for the first of the listening tests with the orchestral test disc. The sound was lacking in stereo separation, while the presence band droop tended to push the image back, producing the overall effect of a 'small' orchestra playing a way off in a large reverberant hall. The treble was peaky, which put an 'edge' on string tone. Rock music produced a similarly 'lightweight' sound, with 'wiry' guitars and 'splashy' cymbals above a rather boomy upper bass from electric bass guitar. The crossed-pair-miked material had a distorted stereo image due to the frequency balance, though the background was quiet. Flute was too breathy while the woodwinds had a hard treble 'edge'.

Tuner

Aiwa's ST-R50K tuner is a true digitally-synthesised tuner with quartz locking and of course offers automatic scanning up and down the wavebands in addition to ten presets – which can be allocated as the user wishes between the wavebands. The other feature is a 'high blend' facility which reduces the irritation value of noise on distant stereo FM stations by progressively 'mono-ing' the treble. The tuner will also operate on 6 volts DC. There is a mute level control on the back panel, which enables the user to set the aerial signal level at which the tuner will accept or mute broadcast signals.

The tuner measured well in every respect on the test bench and sounded truly excellent in the comparison tests with the reference tuner. Broadcast speech was slightly drier with the Aiwa but barely distinguishable from the reference. With a wind quintet broadcast, the sound was again barely distinguishable with only the slightest loss of presence and weight. This tuner could produce an excellent sound quality on FM stereo. Medium wave was prone to interference but was again of excellent sound quality by AM standard.

Cassette

The Japanese-built SD-L50K cassette deck is quite deep for its bulk, with the touch sensitive transport controls underneath the cassette compartment. The record level meters were clear LED segment meters reading from −20dB to +10dB and marked with the suggested maximum level for each tape type. The tiny tape counter could have done with being as clear as the meters! Two unusual features are provided on the back panel (in addition to phono and DIN-duplicated output record sockets). Firstly a 'tape time' jack connects to the Aiwa MT-50 audio timer (not supplied) which will then show the tape time remaining in minutes and seconds. Secondly a 'player sync' jack offers synchronised dubbing from record decks in the Aiwa range also with this facility.

Tape type recommendations listed in the Aiwa instruction booklet were worse than useless, as the list included obsolete or unavailable tapes in profusion. But with suitable tapes the cassette deck performed well on test in every respect, except the replay speed.

Using the reference turntable with the orchestral test disc a tape was produced on the Aiwa for comparison with the source. Using Maxell UDXL-II tape the Aiwa produced a bright sound which was a bit 'ragged' in brass with some boom in string bass though overall the sound quality was above average.

The pre-recorded orchestral ferric-equalisation tape was replayed next on the Aiwa and showed a good handling of acoustic detail and stereo imaging. There was a fair bass 'weight' though some loss of treble. The chrome-equalisation rock tape lacked 'sparkle' in the treble on the Aiwa, but had a solid clean electric bass guitar line if some boom in drums. Overall, a good sound quality then, though the fast running was noticeable.

Speakers

The SS-E60 speakers are built in stout cabinets with braced angles and thick baffle. The 25mm tweeter is a fabric dome doped with metallised paint. This unit is combined via high-quality crossover with a 180mm reflex-loaded paper bass driver.

Using the reference system, the speakers had a 'brassy', 'nasal' balance on orchestral music, with a hard edge to solo violin. Stereo imagery was good in both depth and width. Rock music had a 'fizzy', rather 'tinny' treble quality with little bass 'weight' in drum and bass guitar. The midrange 'hole' shown on the in-room plot leaves voice thin and 'dry'. The string quartet had a nasal 'edge' to string tone with a resonant, 'hollow' midband – the colouration of the speakers was not really acceptable on this material. The crossed-pair chamber excerpt gave a small image in a large resonant acoustic with a hard 'edge' to wind and reed instruments, while the horn lost the bloom and richness in its fundamental tones.

Using the Aiwa turntable and amplifier the SC-E60s sounded bad on disc surface noise, this becoming a pronounced roar. Violins were muffled yet 'squeaky' in the orchestral music while rock music had a 'hollow' and 'ploppy' bass sound with a thin, tinkly top end. The piano had a papery, 'fizzy' distortion in the top end and the instrument lacked body tone or presence in the 25Hz-60Hz region. The sound was found to be fatiguing with a disappointing lack of dynamic development.

Summary

The basic electronics of the Aiwa system worked well indeed, the tuner in particular producing excellent sound quality. The amplifier sounded a little bright and 'feathery' in the treble when heard in the reference system on its own. The cassette deck was provided with useful features and was well built but suffered from over-speed replay with pre-recorded cassettes. Otherwise, the SD-L50K could give a good sound quality with compatible tapes, though Aiwa give no help to the customer in choosing these.

The speakers were of fair quality though did let the electronics down, and put the price of the system up above a level where it offers good value for money. A recommendation cannot really be made for the equipment as reviewed, though the UK built electronics deserve a welcome. The Aiwa D35 turntable is really below par for this system.

AIWA 606

DISC (performance via amplifier)

Frequency response	20Hz – 11kHz	above average
Stereo separation	– 30dB	good
Distortion	1.5%	below average
Hum and rumble	– 67dB	very good
Hiss	– 77dB	very good
Speed variations	0.08%	good
Speed accuracy	0.2% fast	very good
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 17kHz	very good
Stereo separation	– 42dB	excellent
Distortion	0.28%	above average
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	600uV	good
Selectivity between stations	78dB	excellent
Sensitivity, mono	2uV	good
Sensitivity, stereo	23uV	good

Signal strength meter levels (1) 1uV (2) 6uV (3) 16uV (4) 32uV (5) 160uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

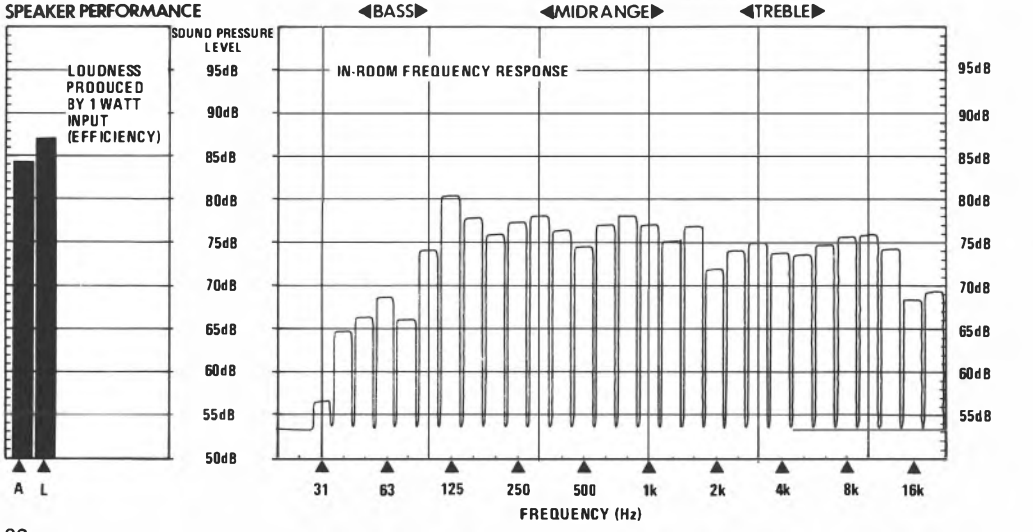
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	Maxell UDXL II	
Metal tape setting	Scotch Metafine	
Frequency response, record/replay:		
Ferric tape setting	20Hz – 13kHz	above average
Chrome tape setting	25Hz – 15kHz	good
Metal tape setting	300Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 11kHz	very good
Chrome tape setting	40Hz – 11kHz	very good
Stereo separation	– 50dB	excellent
Distortion	2.5%	below average
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 59dB	typical
Speed variations	0.05%	excellent
Speed accuracy	1.2% fast	very poor

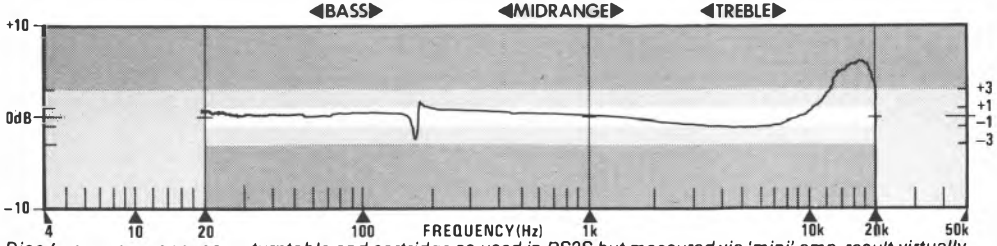
AMPLIFIER

Power output, per channel	36 watts	medium power
Potential maximum volume with speakers supplied	103.5dB SPL	

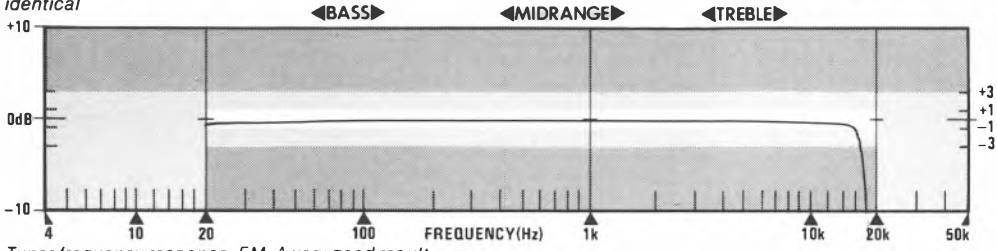
GENERAL

Dimensions	25cm x 25cm x 26cm
Speaker dimensions	36cm x 23cm x 23cm
Price	including speakers, £455

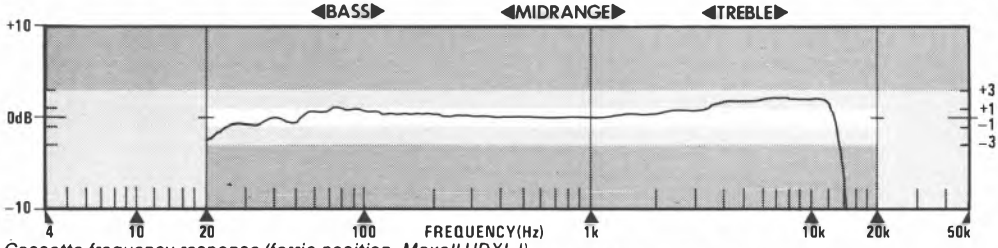




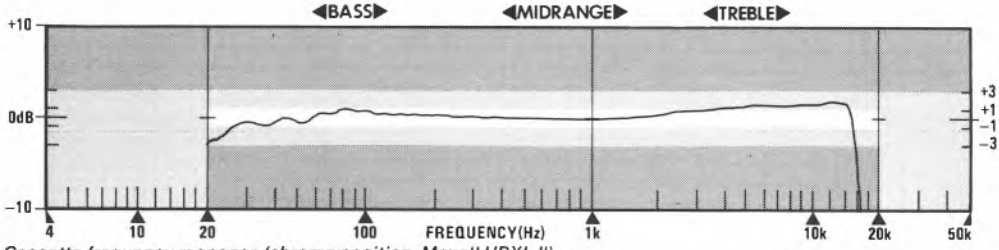
Disc frequency response – turntable and cartridge as used in RS2S but measured via 'mini' amp, result virtually identical



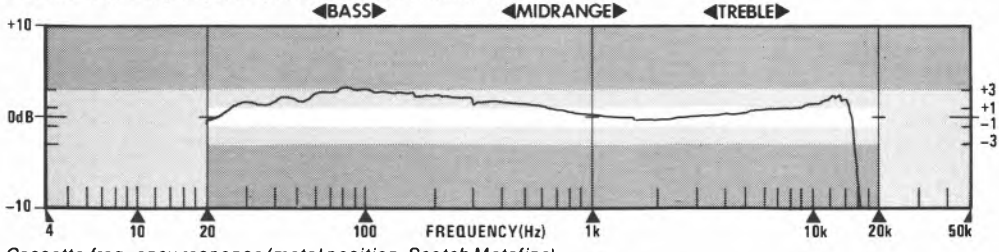
Tuner frequency response, FM. A very good result



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, Maxell UDXL II)



Cassette frequency response (metal position, Scotch Metafine)

Akai Pro 1011

Akai (UK) Ltd, Unit 12, Haslemere Heathrow Estate, Silver Jubilee Way, Hounslow, Middlesex
Tel 01-897 0490

Akai products, like Rotel's, were once imported by a division of Rank Organisation, but went 'direct' with the formation of Akai UK Ltd some two years ago. The Pro 1011 system comes at the bottom of their current rack range which matches rather differently-styled Japanese designed equipment with Hungarian built speakers.

The RV-1000 audio rack for the Pro 1011 system came well packed with excellent instructions, though assembly is easier with two people due to the rather unstable nature of the half-built rack. The finished rack is heavy but castored which doesn't help isolate a turntable from vibration too well on a carpeted floor. The printed glass, badges and neat hinges gave the rack a good finish.

Disc

The Akai AP-B21 turntable is a basic belt-drive model with auto-return-only arm. The plinth however is quite massive and offers fair isolation from external disturbance. The arm is a strange hybrid, looking from its styling as though it should be a low mass straight wand type but having an offset headshell of non-standard design with a slider connection and made of rather bendy plastic. The fitted Audio-Technica cartridge is one of a new generation of budget designs, with one-piece injection moulded plastic cantilever.

The motor unit suffered little from speed drift but ran over 1% fast, which is unacceptable. The AT cartridge tracked well but produced a pronounced high frequency peak through the Akai amplifier.

Distinctively styled, the AM-U11 amplifier features a pair of vertical moving coil (needle) power output meters right of centre on the fascia. The volume control and balance are to the right of the meters while the input selectors have LEDs set in the styling line across the amp. A mono button is fitted, while the treble and bass controls offer reasonable sensible cut or boosts of 6dB (10kHz) or 8dB (100Hz) respectively. The loudness button offers far too big a boost in

treble and bass to be of more than 'sound-effects' use. One tape deck can be accommodated, with duplicated DIN and phono socketry, while only one pair of speakers can be driven.

Using the Akai turntable and amplifier through the reference speakers, listening tests began with the orchestral test disc. The sound was apparently quite flat in frequency response but suffered from a very harsh top end sounding very 'peaky' in brass passages. The rock excerpt had a bright and 'brittle' lead guitar sound while cymbals were very splashy and piano thin and tinkling. The crossed-pair-miked chamber music excerpt had a recessed image with a high frequency 'spike'. The whole sound was spoiled to some extent by noticeable amplifier hiss.

Tuner

The Akai AT-K11L tuner shares the same styling strip or line as the amplifier but here the tuning scale is printed above and below the 'slot' with only the pointer being illuminated. The problem here is that the legends on the tuner's fascia are hard to see with the equipment in the rack's shadow and furthermore the FM frequencies need their markings extended up towards the pointer. The turning knob had a fairly smooth action though the signal-strength meter was of little help with weak stations – nevertheless, a centre-tune indicator enabled low distortion tuning to be consistently achieved in practice.

The tuner was compared with the reference tuner through the Akai amp and reference speakers – though the tuner's own average noise performance and the amp's hiss problem did add up to an intrusive hiss on spoken word broadcasts. Despite the bass-light performance revealed in the frequency response graph the tuner sounded thick and boomy in chest tones of male voice with a sibilant 'edge'. Choral music was 'feathery' and sibilant and lost the low-frequency ambience of the recorded acoustic. Medium wave reception was slightly noisy but had good extension and clear diction on speech.

Cassette

The Akai CS-M3 cassette deck has the same paired vertical moving-coil meters as the Akai amplifier, though they do need supplementing with a peak-reading LED for setting recording levels. This deep-fronted cassette deck has piano-key transport controls beneath the cassette hatch – the keys can be used in combination to give auto play operation. These controls were better than the average with fairly soft touch and positive action. The left and right level record level controls are laid out like the amp's volume and balance control with a knob backed up by a concentric tab.

Test bench measurements showed the Akai's azimuth setting of the tape heads to be badly misaligned and though measurements were done with this corrected, listening tests were conducted with the machine as supplied by the manufacturer. TDK SA tape was used to record an excerpt from the orchestra test disc for replay against the source. The Akai sounded noticeably brighter than the source but good in other respects. The rock excerpt showed a hard treble, especially in cymbal crashes and there was a loss of weight and impact in drum and electric bass guitar.

With pre-recorded tapes the azimuth problem was very obvious, resulting in a very muffled sound lacking all treble. Though the machine could produce a fair sound when adjusted, in its factory delivered condition it proved severely limited for commercial cassette replay.

Speakers

The Akai SR-H33 speakers are of Hungarian manufacture, though Eastern European economics being what they are this seems to ensure that the customer gets better materials for his money. The 15mm chipboard carcass contains a 200mm paper mid/bass unit which crosses over through one choke and a capacitor to a 60mm paper tweeter behind a deep trim. The enclosed air space is damped with teased rag waste while the speaker is supplied with flying leads for connection to the amp.

On the reference system with the orchestral test piece, the SR-H33s sounded rather badly integrated with a boomy bass, hollow mid and a fierce 'spike' which while giving more 'detail', also gave an 'edge' to brass, cymbals and high strings. The rock track had a reasonably tight, forward sound with a 'zippy' peak in percussion while the voice was coloured and recessive. The string quartet had screaming upper string tone with a 'hole' in the presence band pushing the image back – on this material the speakers were unacceptably coloured. On the crossed-pair-miked chamber music the frequency balance distorted the image depth badly. Oboe was 'quackily' coloured while flute was hard.

Reverting to the Akai turntable and amplifier the orchestral test disc was auditioned again though this combination produced a 'weedy', fizzly bright sound. The combination of the paper tweeter's resonance and the cartridge's high frequency spike proved to be too much. On the rock track the system had a very muddled, boomy bass line with bright tizzy cymbals and a hard 'edge' in voice. The high frequency performance of the system produced a 'tap-room piano' colouration in the solo piano piece. Dynamic changes were masked in a uncontrolled bass, badly coloured hollow midtone and brittle treble.

Summary

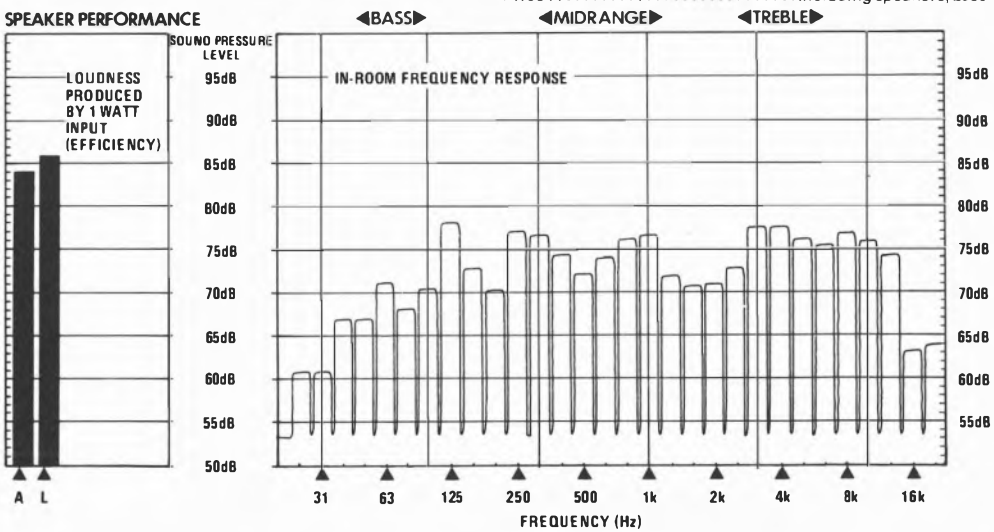
The Akai turntable seems to be crying out for a better headshell and cartridge though there is nothing the consumer can do as the headshell is of non-standard design. The motor unit was not without fault as it ran unacceptably fast. The Akai amplifier was only of low power output (24 watts) and suffered from hiss problems. The tuner in contrast was a good consistent performer both on the test bench and during the listening tests but the tuning scale was badly designed. The cassette deck too suffered from factory misadjustment, azimuth being sufficiently misaligned to amputate the treble content of pre-recorded commercial cassettes. On record/replay fairly good results were achieved, and it seems prudent to recommend that potential purchasers of this system check out the treble performance of the CS-M3 cassette deck they are about to buy by listening to it with a Musicassette. Both the tuner and cassette were to some extent spoiled by the amp's hiss problem.

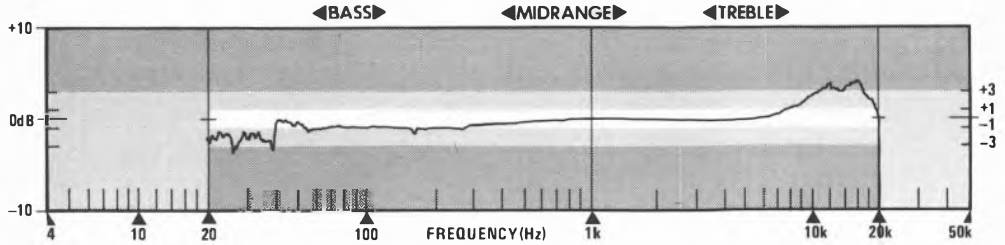
The Hungarian speakers were badly integrated which was a pity considering their build quality and the materials which had gone into them. The disc combination was dreadfully coloured and couldn't really be recommended due to its very 'fierce' top end.

Overall the Akai system did not perform well enough to deserve recommendation though the problems we encountered seem to be due to poor quality control rather than bad design.

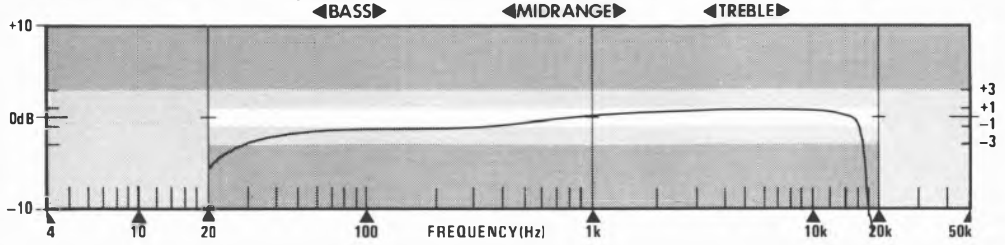
AKAI PRO 1011

DISC (performance via amplifier)		
Frequency response	40Hz – 9kHz	average
Stereo separation	– 23dB	above average
Distortion	1%	above average
Hum and rumble	– 65dB	average
Hiss	– 72dB	below average
Speed variations	0.07%	very good
Speed accuracy	1.2% fast	very poor
Tracking ability	20cms/sec	good
TUNER (performance via amplifier)		
Frequency response	80Hz – 17kHz	very good
Stereo separation	– 42dB	excellent
Distortion	0.1%	very good
Minimum noise	– 68dB	average
Aerial signal for minimum noise	630uV	good
Selectivity between stations	72dB	very good
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	30uV	average
Signal strength meter levels (1) 1.2uV (2) 6.3uV (3) 16uV (4) 25uV (5) 50uV		
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	25Hz – 13kHz	average
Chrome tape setting	28Hz – 14kHz	above average
Metal tape setting	45Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 6.3kHz	poor adjustment
Chrome tape setting	40Hz – 6.3kHz	poor adjustment
Stereo separation	– 46dB	excellent
Distortion	2.2%	below average
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 59dB	typical
Speed variations	0.08%	good
Speed accuracy	0.15% fast	very good
AMPLIFIER		
Power output, per channel	24 watts	low power
Potential maximum volume with speakers supplied	101dB SPL	
GENERAL		
Rack dimensions	102cm x 50cm x 47cm	
Speaker dimensions	42cm x 25cm x 25cm	
Price	including speakers, £359	

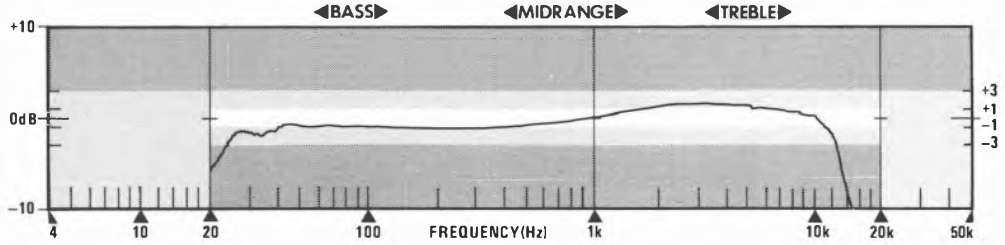




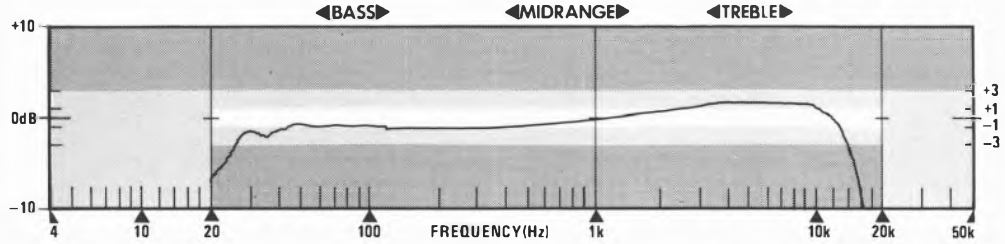
Disc frequency response. Note significant treble peak



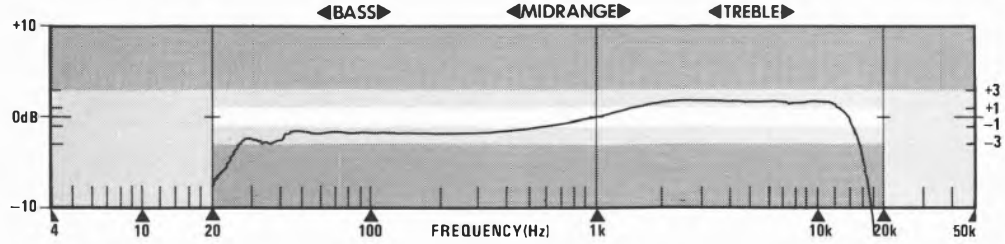
Tuner frequency response, FM.



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

RECOMMENDED

Aurex Micro 10B

Aurex Sales, Toshiba (UK) Ltd, Toshiba House, Frimley Road, Camberley, Surrey
Tel (0276) 62222

The £1000 Aurex System 15 from Toshiba was the first true 'micro' hi-fi equipment seen in the UK. The range of micro equipment expanded downmarket and within a short time the System 10 was revealed, consisting of a metal compatible piano key operated cassette deck, 'analogue' tuner and a miniature integrated amp. This silver-finished equipment was both sold separately and as the System 10 for around £399. Over the last eighteen months a black version of the System 10 has become available. Though black units are not sold separately, the System 10B does have a pair of UK-built speakers included in its 'special' price of £289.

Disc

The Aurex equipment range does not include a miniature ('jacket size') turntable and as most consumers would buy the System 10 for use with a standard turntable, this is how we treated the system in review. The reference turntable, a Dual CS505 fitted with Le Mat from Audioref and a Nagaoka MP11 cartridge was used to audition the Aurex amp with the reference speakers and to audition the Aurex amplifier and speakers in combination.

The Aurex SB-A10B is the black-fascia version of what was the smallest hi-fi performance integrated amplifier. The large central volume control with the concentric ring balance control, along with all other controls, are silver. Record/replay facilities for one tape deck are provided in addition to inputs for disc, tuner and an auxiliary source. The ¼ inch jack to the right of the fascia is not a headphone socket but a microphone input, which, used in conjunction with the 'mic mixing' control next to it, enables the user to produce DJ-type voiceovers. Tape play is selected with a tiny push button, as is the loudness bass-and-treble lift to compensate for the ears' reduced sensitivity to frequency extremes in low level signals. Conventionally engineered 10dB cut or boost treble and bass controls are provided next to another ¼ inch jack for headphones.

Using the Aurex SB-A10B amplifier in the

reference system in place of the reference amplifier on the orchestral test disc, a boomy bass register was noticed with also a tendency to shout in massed brass passages. Rock music was again boomy on electric bass guitar – the rather 'rich' sound tended to sibilance in the vocals and a shouty character when the amp was driven hard. The crossed-pair chamber music recording seemed to lack treble as both clarinet and flute lost their airiness and overtone sweetness. Good imaging and depth was achieved.

Tuner

The ST-T10L tuner is a simple conventional tuner with three waveband reception. The four buttons are for the three wavebands and for FM mute – the tuning knob is free and easy to tune, though the signal-strength meter sensitivities are badly-chosen and all five segments will light even with a very weak signal. On the test bench it was found that the stereo separation was tune-sensitive but that the tune window was very narrow, and so the tuner may not achieve its best separation or lower than 1% distortion in actual use.

On broadcast speech, in comparison with the reference tuner through the reference speakers, the Aurex tuner sounded slightly dry in male voice and lacked the weight and bass 'presence' of the reference. On large scale choral music the tuner sounded 'dry' and 'busy' though switching from one to another showed it not to be as detailed as the reference. Again the ST-T10L lacked the bass 'presence' of the acoustic around the performers space and was slightly hissy too. Medium-wave reception was almost indistinguishable from the reference, which is an excellent performance.

Cassette

The Aurex PC-D10B cassette deck is immediately recognisable by the distinctive cassette-sized tape head cover with its silvered 'figure-of-eight' motif. The piano-key transport controls are below the cassette compartment and though somewhat stiff, they do offer combined operation for 'play-rewind-play' or 'rewind-play-rewind'. Bias and equalisation for different tape types are switched separately. The only other features are the tape counter and the left and right record level controls which, though concentric, have to be held together to achieve even fades.

Using Fuji FX-II tape the orchestral test piece was recorded from the reference turntable and replayed against the source for comparison. Hiss was emphasised on replay with the sound being very good in the midband but lacking sparkle in the treble and weight in the bass. The rock track lacked the dry 'smack' of the small drums and the whole sound was dull in balance with a sense of lost liveliness and dynamics.

With pre-recorded cassettes the Aurex produced a good sound but ran noticeably fast – I pointed this out to Toshiba when I first reviewed a PC-10D in 1980, and they assured me the 1.2% overspeed would be corrected on the production line to a maximum of 0.75%, but this does not appear to have been achieved. With the ferric-equalisation pre-recorded orchestral tape the sound was gently mid-forward with bass a triffle lacking and a bit 'lumpy'. The rock music tape with chrome equalisation had clean bass if lacking in weight though again the sound was mid-forward and dull in the high frequencies – a good sound nevertheless.

Speakers

The Aurex SS-M2 speaker is made in the UK and contains a 45mm paper tweeter with a 120mm paper bass driver loaded by a reflex port and tunnel let through the baffle. The five element crossover is glued to the back panel. The in-room plot shows a lack of smooth integration in the speakers with a deep dip to the crossover point at 2kHz, though in their favour the speakers seem to have no peakiness (the 125Hz peak on the graph is a room mode). Notice, though, the lack of bass extension and rolled off high frequencies.

The speakers certainly sounded smooth on the reference system, with enhanced depth to the stereo image. The speakers' sound was surprisingly clean and dynamic with only some sense of lost bass – not surprising with such a small box – though they could sound 'ragged' when pushed. On the rock track they couldn't cope with high levels of bass and lost all 'punch' from the kick drum. The string quartet had a boxy 'hollow' midrange quality though there was some sense of the recorded ambience. The crossed-pair-miked chamber excerpt had good stereo separation and depth and though their frequency balance wasn't correct the M2s were free from peaky colouration and sounded extremely fine on this material.

Continuing to use the Aurex speakers and the reference turntable, but replacing the reference amp with the Aurex amp, the orchestral test piece was tried again. The sound had lost top and mid detail but the sound was still unfatiguing with good depth information, stereo presentation and dynamics. The rock track was 'lively', and though lacking 'weight' and 'presence', was good in the midband and top. The speakers were at least easy on the ears if the bass was doubled and lacking at the bottom end. Piano was boomy in its lower register and sounded rather rounded in midtones. Though

the impression of a solo piano was good it lacked convincing weight and percussive power.

Summary

The amplifier produced 24 watts on test but gave 36 watts into a 4ohm load so efficient 4ohm speakers could be matched to produce deeper bass if required without causing the amp to run out of steam. The phono input caused some problems with cartridges like Ortofons, Shures or ADCs as the input had a low input impedance of 38kohms and high capacitance at 242pF. Low inductance designs like the Glanz or Grado would give flatter response traces, being unaffected by this input characteristic.

The amplifier lacked bass precision and could sound hard-pushed in the treble. Yet these shortcomings were not revealed in combination with the SS-M2 speakers which were themselves liked for being free from peaky colouration. The combination worked well, if lacking frequency extremes. The ST-T10L tuner could offer fair sound quality (though is only 75ohm compatible and must be used with a good aerial – simple wire dipoles will not work even though they may light up the signal strength LEDs). The PC-D10 cassette deck spoiled its potential by running fast on pre-recorded cassette replay. On the record/replay tests it seemed under-biased for ferric and metal tapes and thus has poor tape compatibility.

At the new low price of £289 and despite its weaknesses this system can be recommended for its style, quality finish, fair sound and the inclusion of a pair of speakers that are not fatiguing to listen to.

AUREX 10B

DISC (performance via amplifier)

Frequency response	20Hz – 3kHz	matching problem
Stereo separation	– 37dB	excellent
Distortion	1.3%	average
Hum and rumble	– 67dB	very good
Hiss	– 76dB	good
Speed variations	0.08%	good
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	40Hz – 14kHz	above average
Stereo separation	– 33dB	good
Distortion	1%	poor
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	630uV	good
Selectivity between stations	75dB	very good
Sensitivity, mono	2uV	good
Sensitivity, stereo	22uV	good

Signal strength meter levels (1) 5uV (2) 10uV (3) 16uV (4) 25uV (5) 40uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting BASF LH I
Chrome tape setting Fuji FX II
Metal tape setting Scotch Metafine

Frequency response, record/replay:

Ferric tape setting	50Hz – 7kHz	poor
Chrome tape setting	30Hz – 12kHz	average
Metal tape setting	50Hz – 3kHz	appalling

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 9kHz	above average
Chrome tape setting	40Hz – 10kHz	good
Stereo separation	– 49dB	excellent
Distortion	1.2%	above average

Noise, Dolby in:

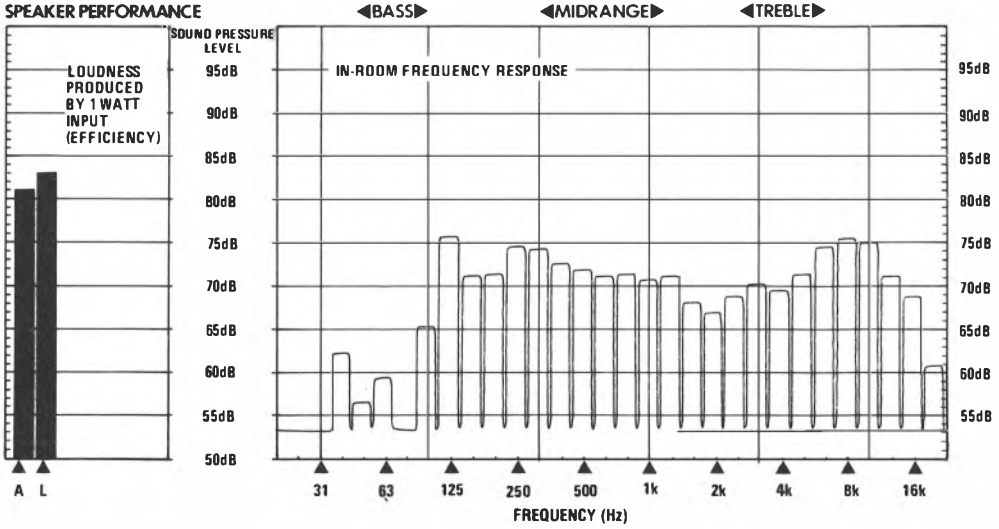
Ferric tape setting	– 59dB	typical
Chrome tape setting	– 59dB	typical
Metal tape setting	– 60dB	good
Speed variations	0.1%	above average
Speed accuracy	1.2% fast	very poor

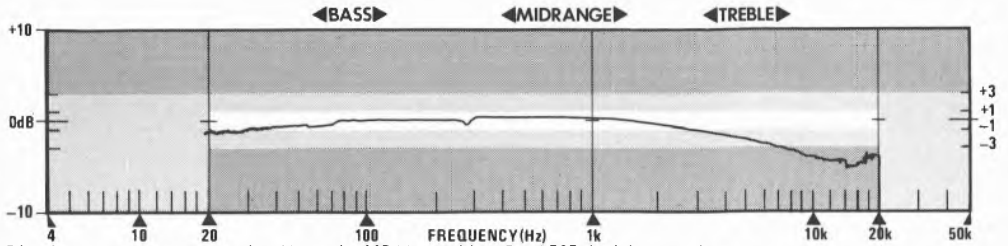
AMPLIFIER

Power output, per channel	24 watts	low power
Potential maximum volume with speakers supplied	98dB SPL	

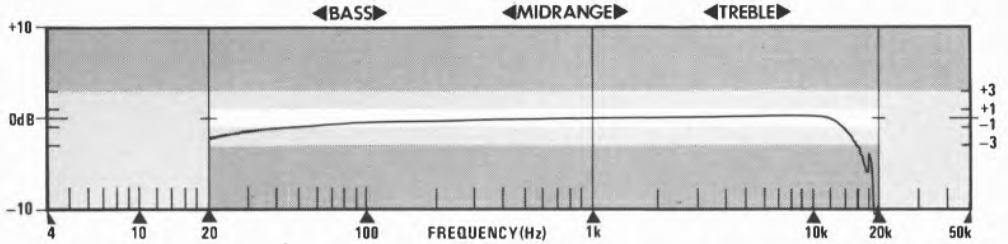
GENERAL

Dimensions	26cm x 23cm x 22cm
Speaker dimensions	21cm x 16cm x 18cm
Price	including speakers, £289

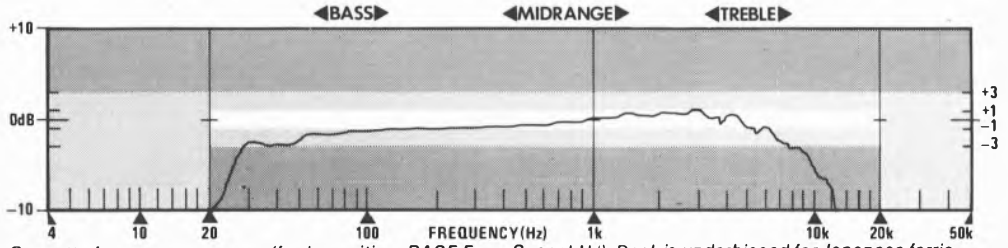




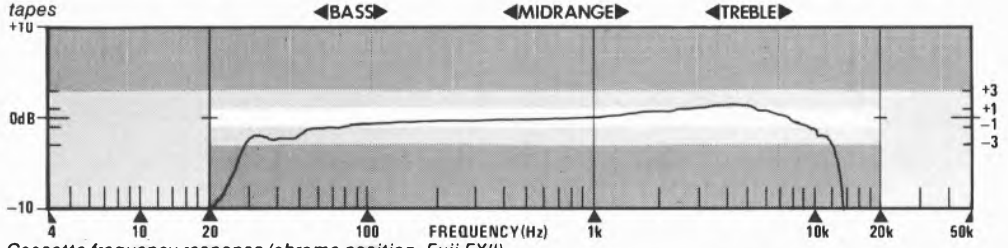
Disc frequency response using Nagaoka MP11 cartridge, Dual 505 deck (see text)



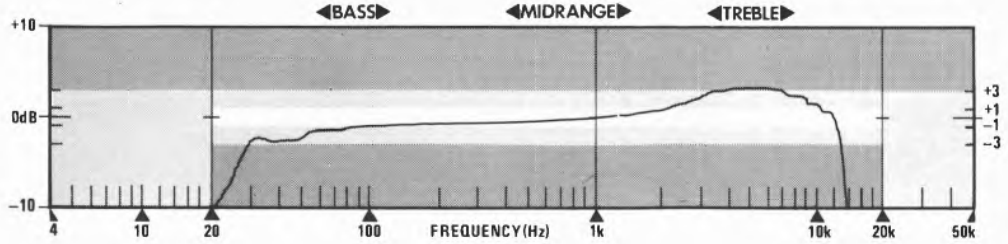
Tuner frequency response, FM. Quite good response



Cassette frequency response (ferric position, BASF Ferro Super LH I). Deck is underbiased for Japanese ferric tapes



Cassette frequency response (chrome position, Fuji FXII)



Cassette frequency response (metal position, Scotch Metafine)

Aurex System 40

Aurex Sales, Toshiba (UK) Ltd, Toshiba House, Frimley Road, Camberley, Surrey
Tel (0276) 62222

The Aurex brand name first appeared in the UK some three years ago. Aurex was originally Toshiba's 'up market' name, associated with their micro hi-fi equipment and ADRES noise reduction units, but the catalogue now includes a wider range of cassette decks and conventional-sized rack systems, among them the System 40.

The Aurex AR-40V rack itself is produced in West Germany rather than in Japan, as with current Toshiba racks. It comes well packed with a full tool-kit for assembly but as there is no preassembly done for the customer the packing includes a bag containing a jumble of over 80 different pieces of hardware! The instructions run to six confusing sides and the rack plinth is enough to dissuade even the DIY enthusiast as it contains so many fixing holes it looks at first sight as though termites have been at it.

Disc

The Aurex SR-A25 is a badge-engineered version of the Toshiba SR-A25 reviewed as part of the Toshiba System 25. The turntable comes fitted with a 320M cartridge in the auto return only straight low mass arm. The motor unit of the Aurex turntable was not up to the performance level of the Toshiba unit as it suffered from a terrible motor drone at 100Hz which reduced the hum and rumble figure to a bad 55dB. The response frequency trace for the 320M cartridge through the Aurex amp shows a very similar characteristic to the 320M cartridge measured in the Toshiba system. But with the Aurex version, via the Aurex amp, the presence band seems more sucked-out while the trace shows a heavier upper bass and a broader, less peaky high frequency rise. Both traces show a slight arm 'hiccup' at 200Hz. This 320M cartridge tracked quite as well as the one on the Toshiba system and also produced a good low distortion figure.

The SB-A45 Aurex amplifier is a neatly-designed amp with distinctive horizontal covers for the source selector and tape switching. Two tape decks can be connected to the SB-A45, which offers full dubbing facilities and phono,

tuner and auxiliary inputs. Two pairs of speakers can be accommodated though only one pair may be driven at once. A mono button is provided, and a bass-boost only loudness control, in addition to the conventionally-engineered 8dB cut or boost tone controls.

The Aurex turntable and amp were auditioned first through the reference loudspeakers with the orchestral test disc, which took on a 'feathery', edgy treble quality but with a 'laid back' stereo image, due to the presence dip in frequency response. The cartridge sounded 'spitty' on some brass transients and though there was some boominess in the bass the sound was fair.

Electric bass guitar in the rock excerpt sounded blurred, vocals sounded hollow and distant while cymbals had a 'fizzy' high frequency edge. The crossed-pair chamber recording had a thin woodwind sound with a high frequency 'squeakiness' in flute and oboe. Lateral stereo imaging was good but the depth of image again was distorted by the frequency balance. The turntable's motor drone could be heard throughout this excerpt.

Tuner

The Aurex ST-T35L tuner is a slimline conventional 'analogue' design with a wide tuning scale but no scale light, which seems unacceptable at this price and causes tuning difficulties with the equipment in the shadow of the rack. The cursor has a centre-tune indicator which also works on AM – this is absurd in as much as the indicator will show a 'centre-tune' reading right across the spread of the AM broadcast's skirt width. The FM mute proved ineffective too as, contradictorily, the centre-tune indicator could be lit (indicating correct reception) and yet the station still be muted (indicating too weak a signal) – which implies bad alignment rather than bad design. It was impossible to achieve consistent minimum-distortion tuning on the test bench as distortion varies with tune position – we estimate 1% distortion will occur in practice. The tuner measured poorly in most respects.

On spoken word the Aurex tuner sounded very chesty and 'fat' in male voice compared with our reference tuner, while the studio background was full of whistles and noise. The sound was considered poor and quite distorted. On a live broadcast of a string quartet, the tone was thickened and 'fat' with a lack of 'air' and suppression of the recorded acoustic. On a broadcast of middle-of-the-road vocal material a spurious high-frequency sound could be heard above the singer's voice (caused by supersonic frequencies beating with parts of the audio signal), while at all times AM breakthrough burbles distracted the listener. Medium wave reception was of fair quality.

Cassette

The Aurex PC-G2T cassette deck is a touch control model with the transport buttons to the right of the fascia. The twin record level sliders were well liked, but the six point LED matrices were distracting rather than helpful.

On the test bench the PV-G2T gave confusing results, showing lower noise performance with TDK AD ferric tape than with the recommended metal tapes – these results were rechecked and confirmed. The deck also gave peculiar results with the usual TDK test tape and the replay response was charted with a Teac tape to avoid the severe 8kHz dip shown using the TDK.

TDK SA tape was used to tape an extract from the orchestral test disc playing on the reference turntable through the Aurex amplifier, and this was then replayed for comparison against the source. Orchestral bass was rich while brass instruments sounded trebly up to a point – but they lost all the 'sheen' given by very high frequencies. This suggests a rising treble response which is sharply cut off. The overall sound was full and forward. The rock excerpt suffered from 'smeared' bass in the electric bass guitar and kick drum lines. The top end in cymbal crashes was dull, yet the sound was forward lower down in voice. The sound lacked 'life', sounding very rounded and bland.

The pre-recorded ferric-equalisation orchestral tape was tried next, and this sounded very dull with amputated treble and a lot of replay noise. The pre-recorded rock chrome-equalisation tape sounded very dull.

Speakers

The Aurex SS-40 speakers are 'badge-engineered' versions of the Toshiba SS-350s which are reviewed as part of the Toshiba System 25. These speakers are built in the UK and contain three drivers a 190mm paper bass unit, a 110mm paper midrange unit and a 19mm plastic dome/cone tweeter.

When the Aurex equipment was auditioned through the SS-350 speakers, the Aurex turntable drone seemed to excite a cabinet resonance in the speakers as the system 'drummed' at this frequency. The orchestral disc sounded lacking in dynamics with a 'laid back' stereo image and nasal string tone. The stereo separation was not clearly defined in this combination and the cartridge's presence suckout with the speaker's colouration made for a very distorted image depth. The rock track had a cardboardy bass quality with a high frequency edge to cymbals, voice and guitar. The stereo image was not accurate, but 'skewed' with dif-

ferent frequency bands having different stereo separation and imaging characteristics. Piano had a droning boomy left hand bass with little sense of percussive attack in the rounded tone.

Summary

The Aurex-branded turntable was as bad as the Toshiba model, though rather than running fast, the SR-A25 supplied with this system suffered from motor drone. Free from either of these problems, the basic turntable could offer fair sound with the fitted cartridge, but poor quality control seems to be conspiring against it.

Auditioned as part of the reference system the Aurex amplifier was found noisy even at zero volume, which suggests that the power supply is poorly smoothed and the output stage noisy. The amp sounded muffled, 'sluggish' and 'loose' compared to the reference amp.

The tuner was again victim of poor factory alignment but suffered from the additional handicap of having no tuning scale light. The cheaper Toshiba ST-T25L tuner, with an illuminated scale, produced far better results. The cassette deck too was disappointing and seems better suited to high-bias ferric tapes than most others. The replay of commercially recorded cassettes will be a disappointment on this machine if our sample is truly representative.

The speakers sounded coloured and a good two-way design would have shown up so much better on test than a badly integrated three-way box. The individual and overall performance of the units in this system was very poor and recommendation is clearly out of the question.

AUREX SYSTEM 40

DISC (performance via amplifier)

Frequency response	400Hz – 20kHz	very poor
Stereo separation	– 29dB	good
Distortion	0.4%	excellent
Hum and rumble	– 55dB	appalling
Hiss	– 72dB	poor
Speed variations	0.08%	good
Speed accuracy	0.5% fast	below average
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	28Hz – 7kHz	poor
Stereo separation	– 35dB	very good
Distortion	1%	poor
Minimum noise	– 68dB	average
Aerial signal for minimum noise	1mV	average
Selectivity between stations	63dB	average
Sensitivity, mono	3.2uV	average
Sensitivity, stereo	45uV	poor

Signal strength meter levels (1) 2.5uV (2) 6.3uV (3) 16uV (4) 25uV (5) 400uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

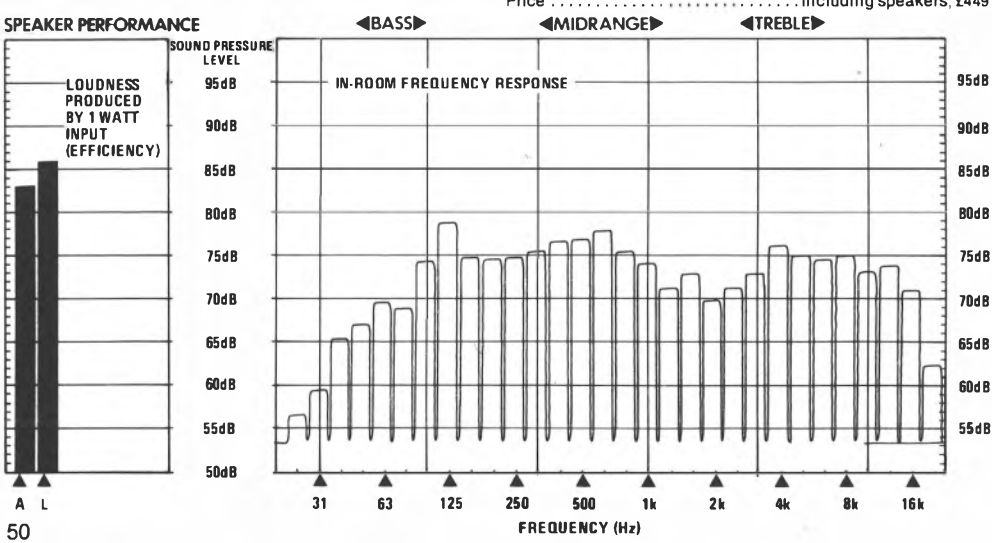
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	45Hz – 10kHz	below average
Chrome tape setting	45Hz – 10kHz	below average
Metal tape setting	45Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	50Hz – 6kHz	poor
Chrome tape setting	50Hz – 6kHz	poor
Stereo separation	– 53dB	excellent
Distortion	2.1%	below average
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 54dB	very poor
Speed variations	0.15%	below average
Speed accuracy	0.4% fast	average

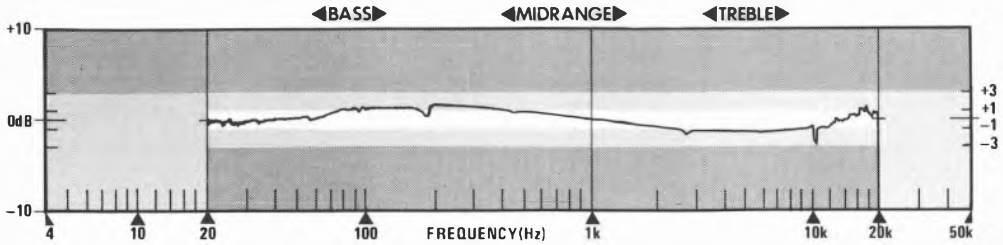
AMPLIFIER

Power output, per channel	66 watts	high power
Potential maximum volume with speakers supplied	104dB SPL	

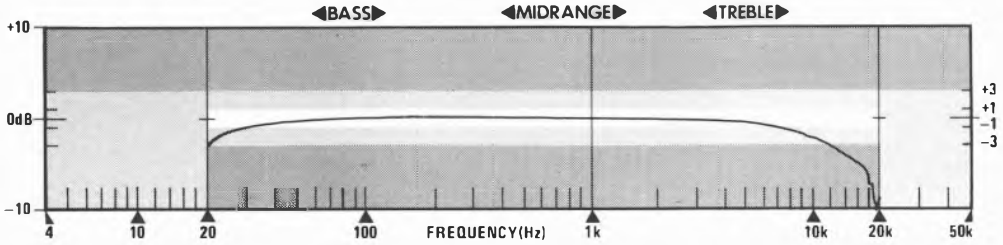
GENERAL

Rack dimensions	91cm x 47cm x 42cm
Speaker dimensions	49cm x 30cm x 20cm
Price	including speakers, £449

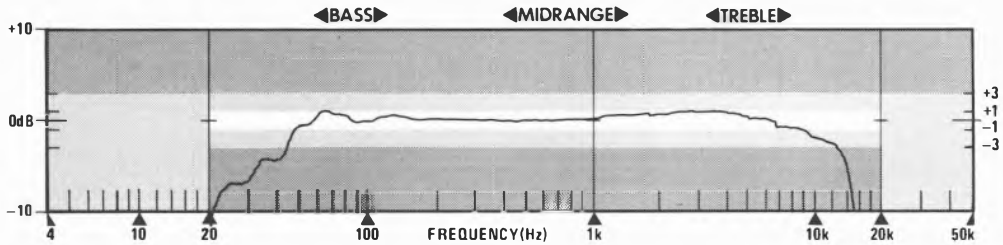




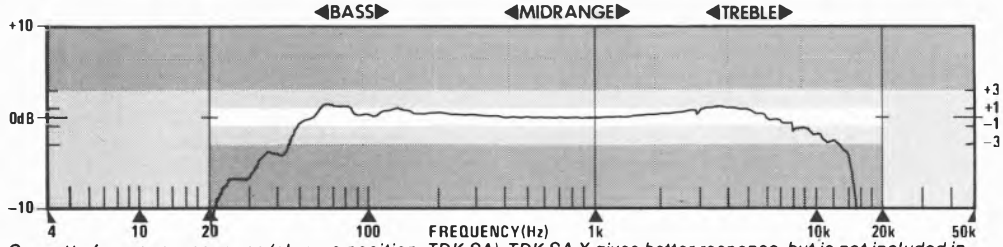
Disc frequency response. Cartridge supplied is fairly good



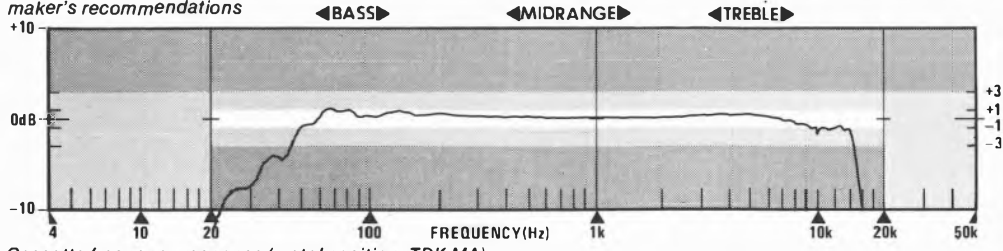
Tuner frequency response, FM. Note falling response at top end



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK SA). TDK SA-X gives better response, but is not included in maker's recommendations



Cassette frequency response (metal position, TDK MA)

Bang & Olufsen Beocenter 7002

Bang & Olufsen (UK) Ltd, Eastbrook Road, Gloucester GL4 7DE
Tel (0452) 21591

Bang & Olufsen equipment from Denmark is unique in that it combines advanced audio engineering with the best in Scandinavian styling. The Beocentre 7002 is a music centre containing a turntable, cassette deck and receiver in the one chassis, but this is up-market equipment and in addition to the remote control offered there is the facility to programme the equipment to operate with the built-in clock. Unattended recording and memory playback of radio programmes is possible with the 7002.

Disc

In the 7002 the turntable is under the left side perspex cover. The only controls for it are the four touch plates to the left of the unit which stop the turntable and select the correct speed. The 'turn' control causes the platter to revolve only, while pressing the 'phono' button on the right hand side keypad starts a record playing. There is platter sensor in the centre-less 45 single adaptor which senses the weight of the record placed over it and cues the arm automatically. The platter itself is rather insubstantial and has no mat for damping.

The fully automatic arm has only a calibrated counterbalance for adjustment of the tracking weight and even that shouldn't need to be touched as downforce is set by the manufacturer during assembly. The cartridge is a factory-fitted B&O MMC 20EN model fitted with an elliptical stylus set to track at 1.2 gram. The B&O turntable motor unit measured fairly well though better speed accuracy could have been achieved. The cartridge measured well in every respect bar its frequency response – most notable was the excellent stereo separation and the fine tracking ability.

The amplifier section of the 7002 delivered a good 40 watts on test and a fair 64 watts into the 4ohm load. All connections for speakers, microphone and auxiliary inputs are made via DIN sockets. The tone control sliders were rather severe in their action, the balance too being fast acting. A loudness button underneath the wood trim and below the keypad gave a fair compen-

sation for the ears' reduced sensitivity to frequency extremes at low levels being designed to vary inversely with the volume level. Two pairs of speakers can be connected.

The 7002 disc section was first auditioned through the reference speakers with the orchestral test piece, which produced a 'lightweight' sound with no power in timpani or percussion – a suprising finding considering the measured response. The treble was gently attenuated as expected, with a leaden sound to brass and dull flute tone – the frequency balance additionally pushed the image back. Rock sounded well detailed but with a fairly heavy muddled upper bass and a dull mid-rich balance with a lack of sparkle in cymbals. The crossed pair chamber recording had a dull sound in clarinet and flute while the image lacked presence though the lateral placement of images was excellent.

Receiver

The tuner section of the B&O 7002 has five FM-only presets and one FM or MW/LW preset, which also offers continuous manual tuning with the rotary control beside the very cramped tuning scale. The five major presets are tuned with wheels and small tuning scales. A centre-tune meter with two lights is the only tuning aid provided.

On broadcast speech, in comparison with the reference tuner, the B&O tuner section had a slight brightness and 'clacky' colouration in male voice, while female voice sounded slightly sibilant. On classical orchestral music the tuner section was again brighter than the reference with detail of the depth and acoustic less clear and some bass weight missing. The stereo image was brought forward on the B&O, but the sound quality overall was considered to be very good. The B&O medium-wave section was auditioned against the reference, when the sound was found to be 'small' (being bandwidth limited) and not particularly clear in speech.

Cassette

To start a tape playing back on the 7002, you simply press the 'tape' button on the keypad, which also starts the electronic tape counter at 0000, whether with a new cassette or a half-played tape. The instruction booklet gives 'minute to counter number' conversion tables which give the user a guide as to how much tape has been used or how much remains. The tape counter also can be used to find a place on a tape. Pressing the counter switch will cause the deck to look for a tape 'address' which has previously been set up with the keypad (which now works as 0-9 digits with an 'OK' entry button for programming).

To record, the 'record open' button is pressed first, when the machine will go into the record/pause mode with the record level meters operating. The meters are then used to adjust the record level with the single slider for combined left and right channel level – no left/right balance is provided. The meters give the higher channel signal reading, between −15dB and +5dB. Pressing 'record' starts the tape running. The 7002 cassette sections also features automatic switching for ferric and chrome tape types.

As the 7002 is a music centre it does not have a phono input and so the record/replay test could not be conducted using the reference turntable to record the disc from. Instead the B&O turntable section was used as a 'source' reference, which was quite satisfactory considering its good performance and that our requirements were for hearing differences rather than judging absolutes. Using BASF Chrom II tape a section of the orchestral test disc was thus recorded and replayed against the source. The B&O cassette section sounded bright, but the presence band was obviously 'sucked out', as could be heard from the enhancement of stereo image depth. Bass detail was very good indeed. The rock track showed a 'fattened' upper bass quality in electric bass guitar with a lack of presence in voice but a high frequency splash in cymbals. The sound was muddled and lacked precise tonal accuracy in the recorded production effects overlaid on the electric bass.

Pre-recorded ferric tape was tried next, and revealed a good, clean bottom end with a bright forward orchestral sound lacking stereo depth. The rock tape sounded rather fizzy and bright but had a tight bass line.

Speakers

The Beovox S80 speakers are beautifully produced and use three drivers of Scandinavian design and manufacture. The carcass is double-veneered 12mm chipboard with 20mm square battens on the edges for reinforcement and to take the baffle. The air space is stuffed with fibre. The tweeter and midrange unit have their own sealed compartment made of compressed foam while the bass driver alone vents into the cabinet.

The speakers have sacrificed efficiency, through the incorporation of such a large crossover network, but the in-room plot showed a disappointing lack of integration with a steep treble loss and deep suckouts centred on 4kHz and around 300Hz. Using the speakers on the end of the reference equipment these trends were quite apparent in the, 'thin', 'hollow' and recessed orchestral sound off the test disc – though bass extension and clarity was felt to be

good. The rock track had no weight in the voice which gave the vocalist a piping quality. The bass had a good 'smack' in kick drum passages.

With the speakers connected to the B&O 7002, the orchestral sound had a 'feathery' recessed treble quality to strings, with an enormously resonant acoustic which made this disc sound very dated. There was now a trace of boom or overhang in the bass. Rock music was curiously coloured – it seemed as though the equipment had purposely been equalised with this type of material in mind. Piano showed a resonant colouration in the low-frequency body tone of the instrument, with a dull unpercussive treble and 'clangy' midband which spoiled the good stereo image.

Remote

The neatly-designed handheld remote control gives control over volume about a preset point, tape transport functions, disc cueing and preset selection.

Summary

The B&O equipment is elegantly styled and this alone will be recommendation enough for many buyers. The disc, tuner and tape sources performed well if not exceptional though the programming controls were found confusing and their layout under the 'bonnet' rather inconvenient. The speakers produced a surprisingly coloured sound for a product that is obviously built with care and top-grade components. At its quoted price the B&O 7002 cannot command a recommendation.

B&O 7002

DISC (performance via amplifier)

Frequency response	20Hz – 3kHz very poor
Stereo separation	– 38dB excellent
Distortion	1% above average
Hum and rumble	– 67dB very good
Hiss	– 75dB above average
Speed variations	0.1% above average
Speed accuracy	0.3% fast average
Tracking ability	20cms/sec good

TUNER (performance via amplifier)

Frequency response	22Hz – 15kHz above average
Stereo separation	– 45dB very good
Distortion	0.5% average
Minimum noise	– 71dB good
Aerial signal for minimum noise	630uV good
Selectivity between stations	80dB excellent
Sensitivity, mono	2uV good
Sensitivity, stereo	25uV above average
Signal strength meter levels	– none

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

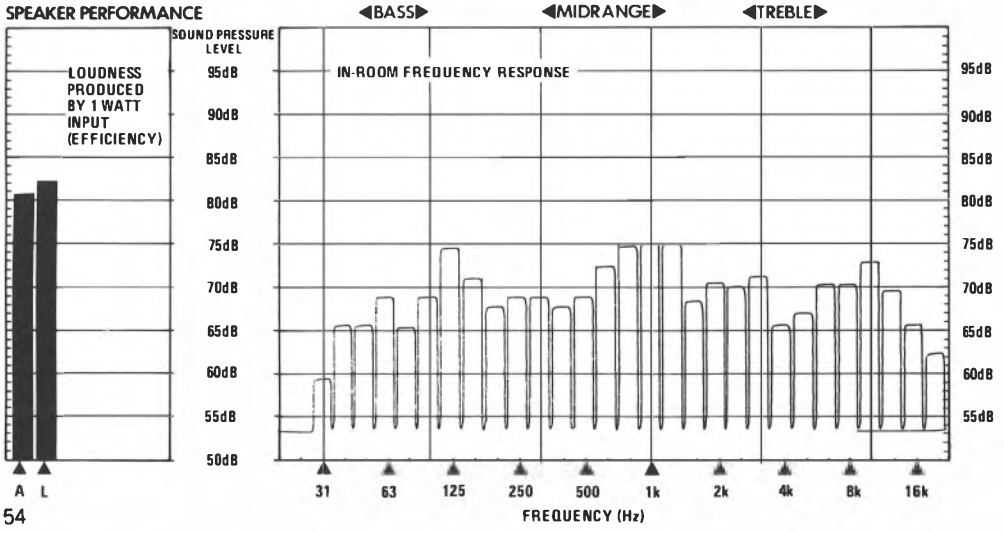
Ferric or Normal tape setting	BASF LH I
Chrome tape setting	BASF Chromdioxid II
Metal tape setting	Scotch Metafine
Frequency response, record/replay:	
Ferric tape setting	26Hz – 15kHz good
Chrome tape setting	26Hz – 15kHz good
Metal tape setting	26Hz – 15kHz good
Frequency response, replay of pre-recorded tapes:	
Ferric tape setting	70Hz – 12.5kHz excellent
Chrome tape setting (Auto tape EQ selection)	not tested
Stereo separation	– 46dB excellent
Distortion	3.4% poor
Noise, Dolby in:	
Ferric tape setting	– 58dB typical
Chrome tape setting	– 61dB good
Metal tape setting	– 61dB good
Speed variations	0.04% excellent
Speed accuracy	0.5% fast below average

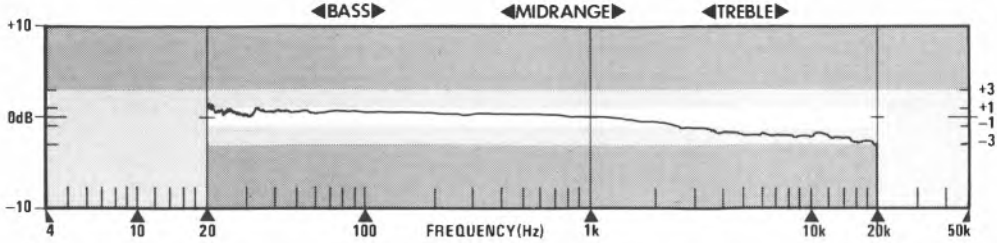
AMPLIFIER

Power output, per channel	40 watts medium power
Potential maximum volume with speakers supplied	100dB SPL

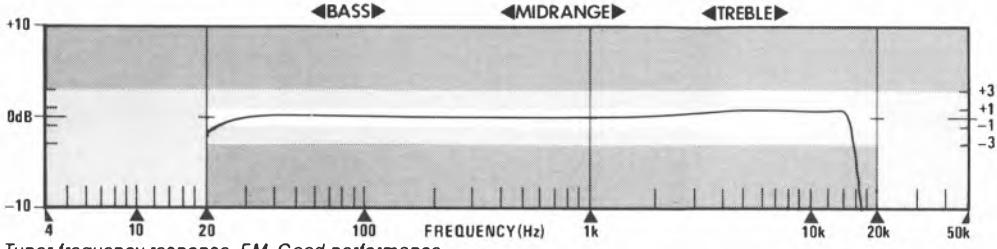
GENERAL

Dimensions	10cm x 72cm x 38cm
Speaker dimensions	53cm x 28cm x 27cm
Price	including speakers, £895

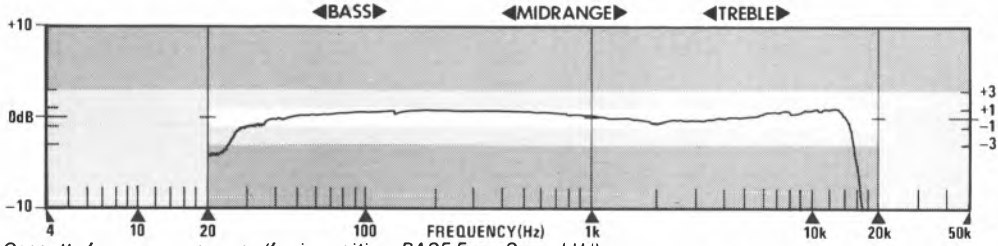




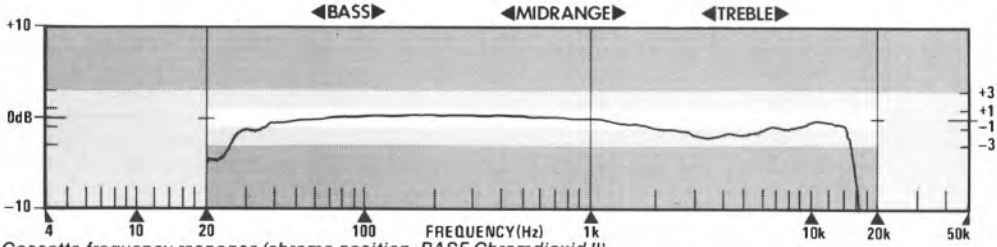
Disc frequency response. Response falls off steadily towards top end



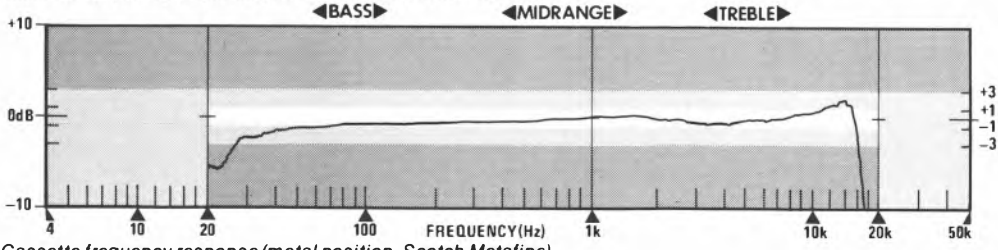
Tuner frequency response, FM. Good performance



Cassette frequency response (ferric position, BASF Ferro Super LH I)



Cassette frequency response (chrome position, BASF Chromdioxid II)



Cassette frequency response (metal position, Scotch Metafine)

BEST BUY

Dual System 2

Hayden Laboratories Ltd, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW
Tel Gerrards Cross 88447

Dual equipment is built in the Black Forest area of West Germany, and while Dual have been traditionally strong as manufacturers of component turntables their range now includes electronics and cassette decks. Dual speakers are not imported into the UK and their System 2 therefore is reviewed here without speakers from the manufacturer.

The 6000 audio rack is delivered in stout packing but has no written instructions for assembly – merely an exploded diagram from which it is fairly easy to identify screws and components, though there are over 90 pieces of hardware. There is no preassembly of hinges or catches to help the customer. The rack was very sturdy once built, with the fitted castors being 'short circuited' by the plinth's skirt resting into our deep pile carpet. The hinges and glass work were substantial but the heavy glass lid needed careful adjustment to prevent it becoming a safety hazard, trapping fingers between itself and the edge of the glass door. The vinyl was rather thick and of uninspired veneer pattern.

Disc

The Dual CS-505-1 turntable is a newly styled version of the very popular 505 model. It has a plastic moulded plinth with suspension pillars on which sits the metal top plate carrying the arm and platter. The deck is belt-driven but pitch control is offered without resort to electronics by the ingenious 'vario-leaf' motor pulley which can expand its leaves or contract them while rotating, thus finely tuning the speed. The speed-change device can never damage the belt on the Dual as the actuator will not begin to move the belt down or up until the platter is actually revolving. The pickup arm is a truly low mass design with excellent bearings and spring actuated downforce, which means that tracking force is independent of gravity – therefore no levelling problems and no record warp-induced hiccups. The new 505-1 model is finished with a wide skirt in bronze and grey metallic paint. No cartridge is fitted – we used the test Ortofon FF15EII.

The Dual CV1150 amplifier is a basic slimline

model, offering connections for one pair of speakers only. Two tape decks can be accommodated, one with phono sockets and one with a 5-pin DIN socket, though a separate tape monitor circuit is provided which offers wide tape flexibility. The phono input has switchable sensitivity between 1.5mV and 5mV sensitivity for high and low-output magnetic cartridges (47ohm input impedance) though Dual would now do well to consider changing one of these sensitivities for a moving-coil input.

The only feature to spoil this otherwise excellent amplifier was the massive 15dB boost and 17dB cut on the treble control at 15kHz. The bass control offers similar 15dB cut or boost at 40Hz. The loudness control offers bass and treble boost to compensate for the ears' lost sensitivity in the frequency extremes when listening to low level signals.

The Dual turntable, fitted with the Ortofon cartridge, and the Dual amp were auditioned through the reference loudspeakers on the orchestral test piece. The bass was more boomy than the reference Dual turntable which shows the effect of the mat fitted to the standard models against the Audio ref mat we used on the reference Dual 505. The stereo image depth was excellent and the turntable proved capable of clean, wide dynamic range sound with stability and detail. The low-level pizzicato cello passage in the test piece was excellently reproduced. Rock music had a clean dynamic sound with decisive, involving rhythms. Kick bass drum was clean and tight with no 'smearing' or overhang. The crossed-pair-miked chamber excerpt was slightly muddled in the bass but the sound showed a good flat frequency response with excellent image depth and stereo separation. Instruments had stable positions in a definite acoustic. The system was noticeably free from hiss or low frequency noise.

Tuner

The Dual CT-1150 is a simple 'analogue' three-band tuner with switched AFC. The wide tuning scale is clearly printed and the signal strength meter sensitivities sensibly chosen which both aid tuning. The flywheel on the tuning knob was rather dead for such a long scale – a centre-tune indicator would have been helpful.

The tuner proved a good all-round performer on the test bench, with low distortion right across the tune window, while the switched AFC would consistently produce low distortion in actual use. The high level of the fifth LED segment on the signal-strength meter for once truthfully indicated that minimum-noise conditions had been reached.

Auditioning the Dual tuner against the reference tuner through its own amp and the reference speakers, spoken word was found to be slightly 'harder' in male voice formants than with the reference. The overall sound was a shade forward and 'loud sounding', due to the frequency balance, but the performance was judged to be very good. On baroque chamber music the Dual showed slightly 'forward' stereo imaging with a slight hissiness and some treble 'shout' – though none of these effects were great or fatiguing. Medium-wave showed excellent treble extension, being very close to the reference (which was designed for the highest quality AM reception possible). The Dual proved noise-free on medium-wave while any slight hiss could be tamed with the amp's treble control without too much loss of signal quality!

Cassette

Dual's C-814 cassette deck features their unique direct 'load and lock' system. This uses two touch-sensitive micro switches to either side of the cassette housing which act as stop overrides, so that the tape stops running as soon as you start to pull the cassette out – preventing the possible damage which can result with 'direct-loading' cassette decks. A head cover comes up automatically when the power is switched off while head access is excellent for cleaning. The transport controls are touch sensitive buttons. The deck also features automatic (and manual switching) tape sensing which reads the spine cutouts on cassettes and switches bias and equalisation accordingly, even ferrichrome tapes are catered for. The moving coil (needle) record level meters have two scales, one for metal and ferrichrome (FeCr) tapes, the other for ferric and chrome. This is a bit odd as chrome (or pseudo-chrome) tapes now have better headroom than the FeCr types. If two categories are going to be drawn up then chrome tape should be included with metal and FeCr.

The two record level controls are rather too far apart to enable even fades to be made – they could have been put closer and the microphone input (stereo ¼ inch jack – not twin mono sockets) moved aside. Peak level LED metering is not provided but surely the two LED indicators for the meter scales could have been set for +3dB and +6dB peak indication for ferric and chrome tape recordings respectively.

BASF Chrom II tape was used to record the orchestral test piece from the reference turntable for replay against the source. The recorded extract showed a slightly thickened balance but was very close to the source. Orchestral bass was a bit 'doubled' (notes sounding an octave up rather than their true fundamentals) but the sound was basically good. The rock excerpt showed a noticeably 'rounded' and less tight bass with a dull balance,

causing a loss of 'presence' in voice and lead guitar.

The ferric pre-recorded test tape showed a slight brightness on replay. Bass was considered clean and extended while the recorded acoustic was well reproduced. The rock chrome-equalisation tape sounded rather boomy and thickened in the bass end though the treble was cleanly extended giving a slight presence boost to voice and guitar.

Summary

When the Dual amplifier was tried in isolation from the other Dual equipment as part of the reference system, it seemed quite capable of being driven nearly flat out without too much problem from treble 'hash' or clipping distortion.

The Dual turntable provided a sound quality second only among those tested to the Technics SL7, which costs nearly three times as much. The tuner performed well and the cassette deck likewise offered spot-on replay speed with very low speed variations. Sadly, the cassette deck did not make the best of the chrome-position reference tape but showed better than average results with ferric or metal formulations. The Dual equipment shows precisely what can be achieved with good design which is aware of the sound quality/cost/facilities equation and knows how to balance it. This system was one of the few where performance on all three sources – disc, FM radio and cassette – can be recommended with equal enthusiasm. A Best Buy is clearly in order.

DUAL

DISC (performance via amplifier)

Frequency response	20Hz – 18kHz	very good
Stereo separation	– 23dB	above average
Distortion	1.5%	below average
Hum and rumble	– 66dB	good
Hiss	– 77dB	very good
Speed variations	0.12%	average
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	38Hz – 12kHz	average
Stereo separation	– 42dB	very good
Distortion	0.2%	good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	700uV	good
Selectivity between stations	78dB	excellent
Sensitivity, mono	2.8uV	average
Sensitivity, stereo	32uV	below average

Signal strength meter levels (1) 0uV (2) 5uV (3) 50uV (4) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	BASF LH I
Chrome tape setting	BASF Chromdioxid II
Metal tape setting	Scotch Metafine

Frequency response, record/replay:

Ferric tape setting	26Hz – 11kHz	average
Chrome tape setting	26Hz – 11kHz	below average
Metal tape setting	26Hz – 15kHz	good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 11kHz	very good
Chrome tape setting	40Hz – 11kHz	very good
Stereo separation	– 50dB	excellent
Distortion	2%	below average

Noise, Dolby in:

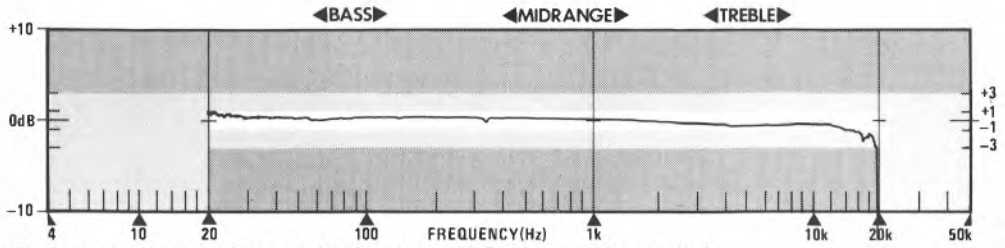
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 63dB	very good
Metal tape setting	– 61dB	very good
Speed variations	0.06%	very good
Speed accuracy	0%	excellent

AMPLIFIER

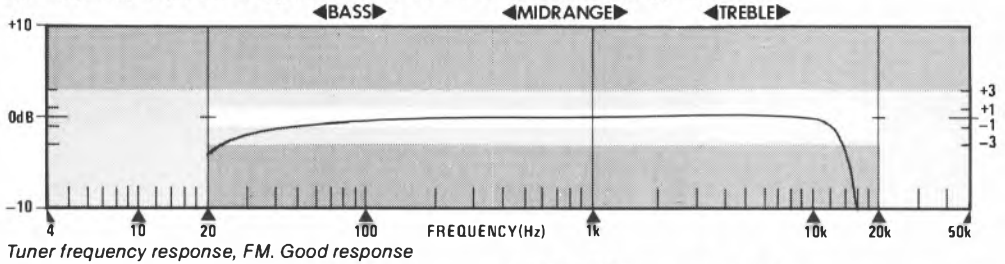
Power output, per channel	36 watts	medium power

GENERAL

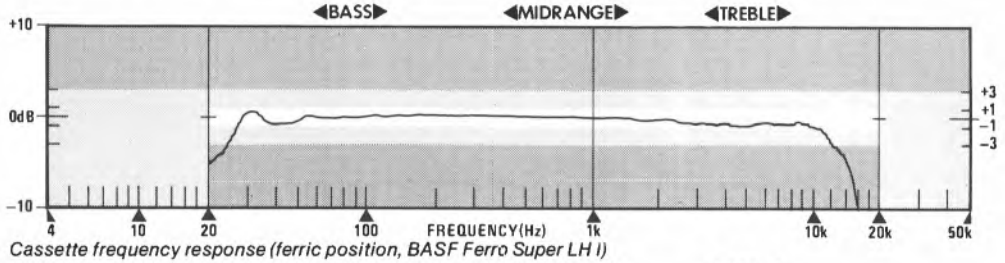
Rack dimensions	89cm x 50cm x 47cm
Price	without speakers, £379



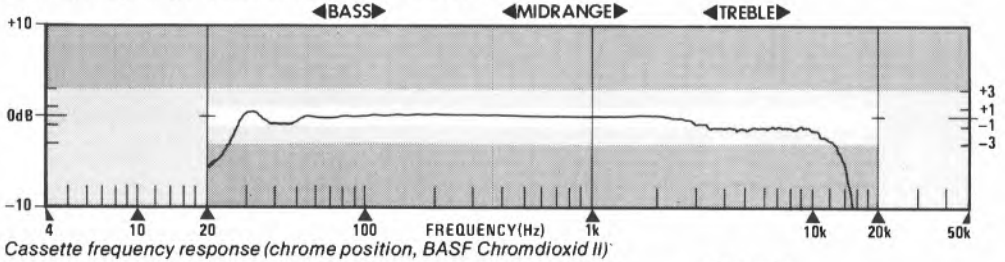
Disc frequency response. Very good performance with Ortofon cartridge supplied



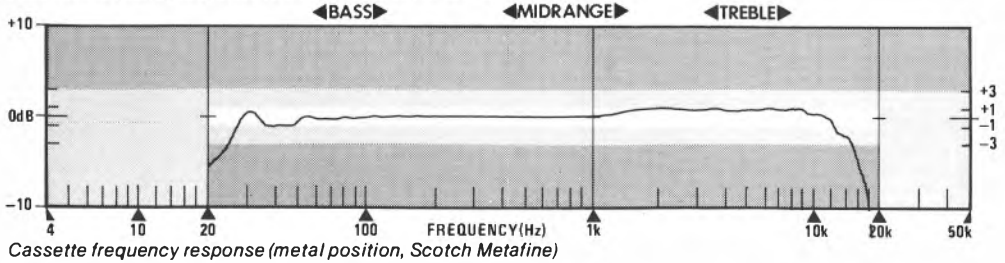
Tuner frequency response, FM. Good response



Cassette frequency response (ferric position, BASF Ferro Super LH I)



Cassette frequency response (chrome position, BASF Chromdioxid II)



Cassette frequency response (metal position, Scotch Metafine)

Fisher 350

Sanyo Marubeni (UK) Ltd, Sanyo House, 8 Greycaine Road, Watford, Herts WD2 7UQ
Tel Watford 46363

In the past Fisher equipment has suffered distribution problems in the UK, but imports are now being handled by the newly-set-up company Fisher (UK) Ltd, Watford. The Fisher racks for the UK market were not ready in time for the review or for photography, so a rack designed for the German market was used at the last minute. Though no comments can be made about a rack we haven't seen, if the ready-built German rack is any indicator, then the finish and styling of the UK model will be good indeed. The German rack was in rich rosewood vinyl finish with chrome tubular trim and glass lid – a substantial rack once the equipment was installed.

Disc

The Fisher MT-650 turntable is a direct-drive with quartz-locked speed. The arm is fully automatic and comes factory fitted with an MG-41 cartridge which appears to be a Mitachi design (this company also produces Glanz cartridges and a wide range of components for Pioneer, Sony, Onkyo and other major Japanese manufacturers). The platter fitted firmly on to the spindle and was covered with a substantial mat but the platter rock was quite bad. The motor unit produced fine results for speed accuracy and drift, though the cartridge fell down on its poor frequency response. Tracking performance, however was good.

Fisher's CA-350 amplifier is described as a 'Class A II' amplifier though there is no explanation of this design technique in the instruction booklet. Simply, Class A II amplification is a technique to eliminate switching distortion which happens when the transistor which handles the plus half of the waveform hands over to its paired transistor which handles the negative half.

The preamp and power amp stages of the Fisher can be disconnected at the 'pre-out' and 'main amp in' sockets to allow insertion of a signal processor, equaliser or similar. Looking through the slats on the top of the amp you can see the 'heat loop' which dissipates the heat from the output transistors rather more effici-

ently than the common finned heatsink. The amp will accept inputs from two tape decks (one DIN duplicated) in addition to phono, tuner and auxiliary inputs. Two pairs of speakers can be driven separately or together. A record selector switch enables the user to record one input source while monitoring another. The tone controls offer conventional 10dB cut or boost at 100Hz in the bass and 10kHz in the treble while the loudness control gives a 8dB boost in the bass and 4dB in the treble. The subsonic filter is for once properly designed with a second-order (12dB per octave) slope below 10Hz.

The Fisher amplifier and turntable were auditioned through the reference speakers with the orchestral test piece. The sound was rather bland with some 'spitty' mistracking in high frequencies and a hard, 'edgy' high frequency sound in string and brass tone. When these instruments were being played hard the high frequency 'spike' could sound fearsomely brittle and would undoubtedly be fatiguing. Bass was rather 'soggy' and featureless. On the rock track electric guitar was stingingly bright while a boomy upper bass from electric bass guitar added to a general bass confusion. The presence band was noticeably recessed which produced a 'laid back' vocal contribution, though the sound in the treble above this point was hard. On the crossed-pair chamber music excerpt, the sound had little accurate stereo separation or depth imaging, everything sounding rather 'smeared' and diffuse – making no sense of the simple milking technique which can produce stunningly crisp stereo images.

Tuner

The slimline FM-550 is a true digitally synthesised tuner offering auto scaning up and down the frequency bands. Each one of the six presets is capable of storing one FM and one AM station. There is no long wave reception on this model. The tuner does not require battery back-up for memory storage but will lose the preset stations if left unplugged for a few days. The signal-strength meter fitted was one of the few such meters we came across to offer any help in tuning, as Fisher have chosen sensible sensitivities for the five LED segments. On the test bench the tuner proved to be good in every respect.

On broadcast speech, compared with the reference tuner, the Fisher lacked the smoothness of the reference and had a 'clackiness' in the transients of female voice. Both tuners were used with their MPX filters switched on and both sounded less good through the Fisher amp than they did through the reference amp. A piano quintet broadcast sounded very flat and close to the reference yet there was still a strange 'edgy' quality which was not brightness but some form of high frequency distortion perhaps. The Fisher was slightly noisier than the reference but could produce excellent imagery. The text-book flat frequency response measured on test was confirmed in practice – the overall sound was considered to be very good indeed but limited by the colouration of the Fisher amp.

Cassette

The Fisher DD-350 is a direct drive cassette deck with full logic control transport to the right of the fascia between the meters and the ganged record level controls. The moving coil (needle) meters were supplemented by three LEDs which offered peak reading. The DD-350 had good head access for cleaning, but had a tiny tape counter and a noisy motor.

The Fisher cassette deck produced very contradictory results on the test bench, with fine performance on the replay-only tests but dreadful results were obtained with the recommended tape types. From the instruction book, Fisher seem to think that TDK-SA tape is for ferric bias (it is in fact a doped ferric tape for use in the high-bias or chrome position). The direct-drive motor gave astonishingly poor results for speed variation, very untypical of this type of drive.

TDK SA tape was used in the chrome position to record an excerpt from the orchestral test disc played on the reference turntable through the Fisher amplifier. This tape was then replayed for comparison with the original source. The replayed sound lacked any real treble extension, sounding 'brassy' in the lower treble yet lacking any 'airiness' above. The sound was confused in orchestral climaxes. The rock excerpt taped and replayed showed a soggy bass quality with unsteady sound while the treble lacked any 'open' qualities and missed out the 'ease' of the source.

Using pre-recorded tapes the Fisher could produce a commendably flat frequency response but this was brought to nought as the machine ran some 1.3% slow, ruining this performance with a dragging tempo and introducing a regular warbling sound from its wow problems. With the ferric orchestral tape the Fisher had a noisy, 'forward' balance with the stereo imagery spoiled by the unsteady replay. The rock chrome-equalisation tape lacked treble extension, with leaden cymbal crashes and a crude, forward balance.

Summary

No speakers were supplied with the Fisher system and the amplifier's high power output (78 watt into 8ohm and over 120 into 4ohms) should

be taken into account when matching speakers are chosen. The amplifier was tried in place of the reference amplifier in the reference system, where it sounded 'loose' in the bass and 'edgy' in the treble. These amplifier characteristics seem to be behind the criticisms of the sound from the tuner and of the turntable. This is a particular shame as the tuner was one of the best-performing tuners tested in this project and yet was brought down by the amp's colouration.

The disc system could immediately be improved by a better cartridge – a fairly compliant cartridge could be safely installed in the low mass arm. The turntable lost out to some extent in bottom end performance as there is no suspension to speak of in its plinth design – the mass of the turntable and rack were the only factors preventing feedback.

The cassette deck proved to be a very poor performer on the record/replay tests against the source yet the replay-only frequency response traces, distortion and separation were all excellent. These good results were never realised during the auditioning tests as the deck suffered from obvious wow and slow running problems.

This level of misadjustment is not expected in equipment selling at this high price and despite the tuner's excellent performance the Fisher 350 system does not deserve recommendation. The finish however was one of the best seen on any of the samples received for review.

FISHER 350

DISC (performance via amplifier)

Frequency response	20Hz – 3kHz	very poor
Stereo separation	– 21dB	average
Distortion	1%	above average
Hum and rumble	– 66dB	good
Hiss	– 76dB	good
Speed variations	0.07%	very good
Speed accuracy	0.1%	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 17kHz	very good
Stereo separation	– 52dB	excellent
Distortion	0.13%	very good
Minimum noise	– 73dB	excellent
Aerial signal for minimum noise	800uV	good
Selectivity between stations	78dB	excellent
Sensitivity, mono	2.3uV	good
Sensitivity, stereo	22uV	good

Signal strength meter levels (1) 8uV (2) 25uV (3) 63uV (4) 320uV (5) 600uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	

Frequency response, record/replay:

Ferric tape setting	28Hz – 3.5kHz	appalling
Chrome tape setting	28Hz – 13kHz	above average
Metal tape setting	28Hz – 1.5kHz	appalling

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	63Hz – 12.5kHz	excellent
Chrome tape setting	63Hz – 12.5kHz	excellent
Stereo separation	– 46dB	excellent
Distortion	0.5%	excellent

Noise, Dolby in:

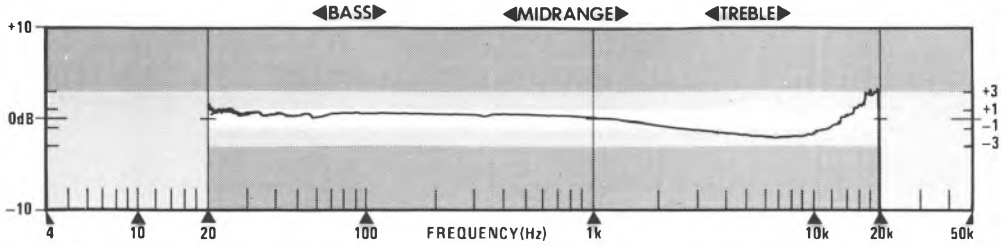
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 59dB	typical
Metal tape setting	– 59dB	typical
Speed variations	0.17%	poor
Speed accuracy	1.3% slow	very poor

AMPLIFIER

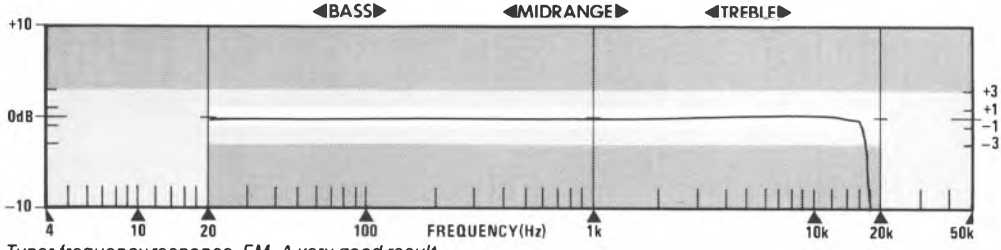
Power output, per channel	78 watts	high power

GENERAL

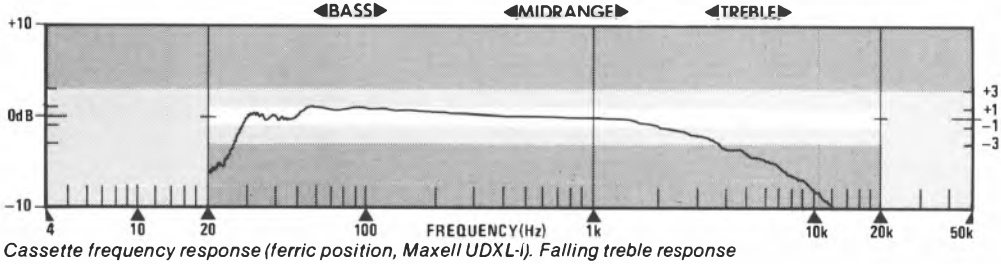
Rack dimensions	not avilable
Price	without speakers, £629



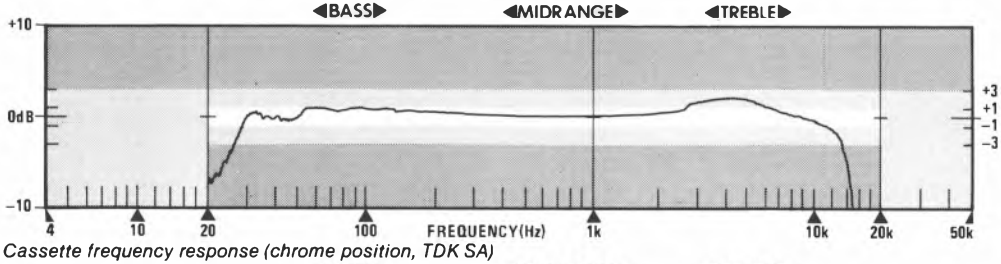
Disc frequency response



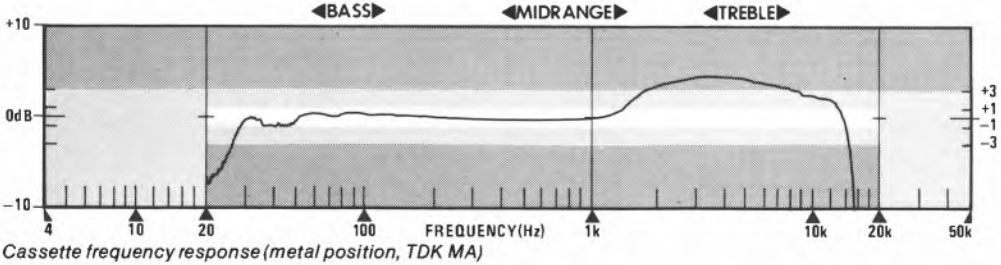
Tuner frequency response, FM. A very good result



Cassette frequency response (ferric position, Maxell UDXL-i). Falling treble response



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

GEC A3000

GEC (Radio and Television) Ltd, Langley Park, Slough, Bucks SL3 6DP
Tel Slough 22201

GEC have put together Far East electronics with UK-built speakers and rack to produce their A3000 system. The E1240 horizontal rack system was delivered well packed though the diagrams were not easy to follow and the instruction leaflet was heavily amended with pasted-over corrections. The rack contains a remarkable number of pieces and though the basic assembly operations were straightforward once the KD fasteners had been mastered, the process was laborious. The massive amount of chipboard in the shelves and battens of the E1240 and the grooved interlocking of many of the pieces goes to produce a sturdy rack that helps with turntable isolation. No castors are fitted and the unit was very heavy. Finish and detail work were excellent.

Disc

A direct-drive model with pitch-control on both speeds, GEC's A-3000P has an auto return only arm of an S-shaped design with a conventional IEC (SME-type) plug-in headshell, though this is of rather flimsy sheet aluminium. The deck comes fitted with an Audio-Technica MG-10J cartridge, which on test showed a high-frequency peak above a treble suckout when measured through the GEC amp. The cartridge's tracking performance was good though, and the turntable motor unit offered accurate speed setting with very little drift.

The GEC A3000-A amplifier is a basic slimline design with DIN or phono connections for one tape deck in addition to the usual phono-socket auxiliary, tuner and disc inputs. Only one pair of speakers can be driven. The balance control has a fair characteristic, the bass and treble controls too being quite well designed, and offering a fair degree of cut or boost – though the bass control seemed to affect the upper bass/low midband region rather too much. The loudness control as usual offers treble and bass boost to compensate for the ear's lack of sensitivity in frequency extremes when listening to low level signals. The 'feel' of the controls was rather poor while both the auxiliary and tuner input selectors

could be pressed together to give a mixed signal through the system!

On the orchestral test disc through the reference speakers the GEC turntable and amplifier produced an image with fairly good stereo separation but a lack of dynamic range. The sound lacked 'presence', while strings and brass tone were 'edgy'. The rock track produced a clean, 'tactile' sound, 'drier' in the treble than the reference and lacking 'presence', but a commendable performance. Bottom end was clean and 'weighty' even if the bass did exhibit a tendency to produce a 'sameness' from sounds which should have reproduced with different timbres. The crossed-pair-miked chamber music lacked treble 'air' in the flute, oboe and clarinet but the image was well separated and had good depth. The sound was very clear, but noisy at all times due to the ever-present hiss from the amplifier and the cartridge's high-frequency peak, which also emphasised disc surface noise.

Tuner

The GEC A3000-T is a basic three-band 'analogue' tuner fitted with flying leads for connection to the amplifier. Interstation mute is provided, though the AFC is manually switched. The signal-strength meter sensitivities were well chosen – though test bench measurement showed up the need for a strong signal for good stereo reception and so the A3000-T may not work in stereo at all in areas of weak or modest signal strength, if the customer uses only the indoor dipole aerial supplied with the tuner.

The GEC tuner was compared with the reference tuner on broadcast speech, when it sounded much drier than the reference in male voice and much more 'forward'. On chamber music with piano and clarinet, the GEC tuner sounded harder and brighter with some loss of detail of the recorded acoustic.

Cassette

The GEC A3000-D cassette deck is a rather bulky unit with centrally-placed cassette compartment and piano key transport controls. The record level controls are not separate for each channel but instead there is a record balance which, in conjunction with the single record level control offers the same flexibility as conventional ganged left/right controls but ensures even fades. The moving coil needle meters were slow-acting and not provided with a peak LED, which would have been a great help in keeping within the ferric and chrome tape recording level headroom (metal tape is not provided for on this machine). The cassette door offered very imprecise loading and the manufacturing tolerances need looking at here as the door on our sample could drop open during play! Additionally, the reel brakes were not adjusted properly which meant the auto stop didn't work at all and when the machine was stopped during fast reeling the cassette body filled up with loose tape before the reels came to a halt. Sooner or later this will cause a tape jam.

This was the only deck we tested without metal tape compatibility, giving the now rather outdated option of a ferrichrome setting instead. Unfortunately, as supplied, the machine did not match ferrichrome tapes properly. BASF Chrom II tape was used to record an extract from the orchestral test piece which was then replayed against the original. The GEC deck's frequency response emphasised disc noise and produced an upper-mid/treble-forward balance which lacked fundamental bass weight. The midband was rather muddled. On rock music the GEC again had a treble-forward quality, pushing voices up-front in the mix and though the sound overall wasn't bad the treble was in the end found grainy and fatiguing.

Using pre-recorded tapes, the cassette deck was auditioned through its own amp and the reference speakers. The ferric-equalisation orchestral tape sounded 'forward' with a 'thick', coloured sound lacking the 'air' and ambience on the crossed pair miked recording. Rock music from the pre-recorded chrome tape had a thick midband forward quality with a pumping doubled bass.

Speakers

The GEC 1613 design is a serious attempt at producing a speaker of hi-fi performance. The stout cabinet, with added stiffness from the recessed back and baffle is fitted with two drivers, a shallow horn loaded 25mm soft dome tweeter and a 200mm paper bass unit with a distinctive blue foam surround.

The in-room plot showed a disappointing mid-prominent response which sloped away above and below the 500Hz to 1kHz band. There is some evidence of booming in the prominence of the 63Hz-centred ⅓-octave bar on the graph.

Connected to the reference system, the GEC speakers sounded a cut above the rest of the rack speaker field in many ways when reproducing the orchestral excerpts – but had a somewhat hollow sound with definite lack of treble – though bass timbre was quite clear. On the rock piece, the bass from kick drum sounded slightly overhung and the vocal line was pushed far forward in the stereo image by the frequency balance which also had the effect of pushing electric piano treble way back. On the string quartet material the mid tones of cello and viola dominated the sound, yet there was a good sense of four individual instruments playing in

an acoustic space. On the crossed-pair-miked chamber piece the speakers made the horn and clarinet very mid-rich and the sound lacked the 'air' and delicate sense of ambience this type of recording can produce.

Using the GEC disc player, amplifier and speakers on the same orchestral test piece produced a muffled distant sound which had very little top end, and the solo violin was almost lost among the orchestra. In the rock track the electric guitar lacked all sparkle while electric bass guitar sounded dull and 'loose'. Voice was 'chesty' while the drums produced a 'grumbly' confused bass sound.

Summary

The GEC A3000 system showed an odd mixture of strengths and weaknesses. The disc system seemed competent, and could easily be further improved by the user with a better cartridge and headshell. The amp suffered from a bad hiss problem which intruded into all but the most compressed material. The tuner really does need a strong signal to work well on FM stereo, when it can produce a fair sound quality. The cassette deck however lacks metal-tape capability and the mechanics of cassette loading and tape transport were unsatisfactory.

The speakers used good materials and seemed to have been intentionally designed with a non-flat response which made them very forward without treble and bass. Even at the remarkably low price of £349, which includes a substantial piece of furniture in the rack, the equipment cannot justify recommendation.

GEC A3000

DISC (performance via amplifier)

Frequency response	20Hz – 6kHz	below average
Stereo separation	– 29dB	good
Distortion	1.3%	average
Hum and rumble	– 65dB	average
Hiss	– 71dB	poor
Speed variations	0.05%	excellent
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 14kHz	above average
Stereo separation	– 37dB	very good
Distortion	0.4%	above average
Minimum noise	– 75dB	excellent
Aerial signal for minimum noise	1.6mV	below average
Selectivity between stations	62dB	average
Sensitivity, mono	3.5uV	below average
Sensitivity, stereo	40uV	poor

Signal strength meter levels (1) 25uV (2) 32uV (3) 40uV (4) 125uV (5) 400uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

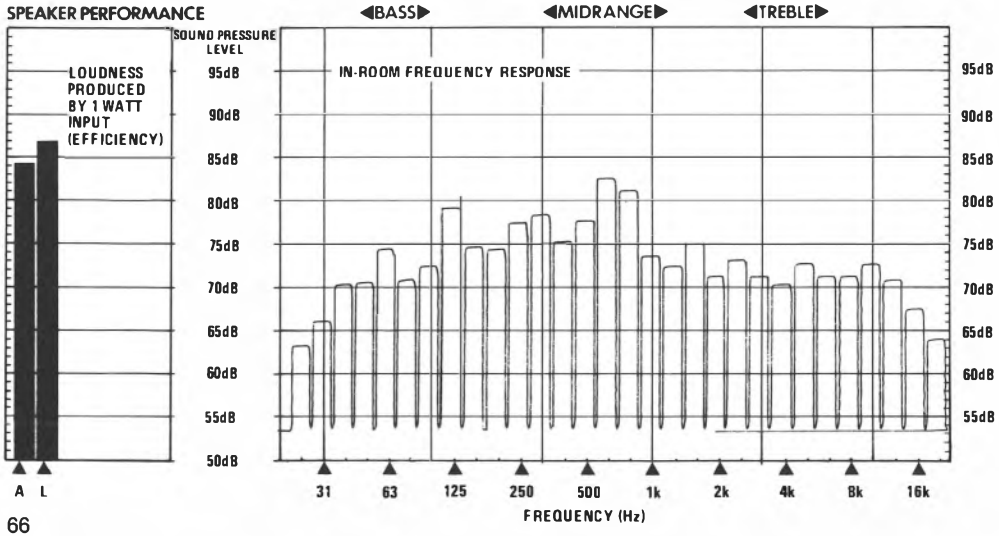
Ferric or Normal tape setting	Sony AHF	
Chrome tape setting	BASF Chromdioxid II	
Metal tape setting	none	
Frequency response, record/replay:		
Ferric tape setting	40Hz – 13kHz	above average
Chrome tape setting	40Hz – 14kHz	above average
Ferrichrome tape setting	30Hz – 2.5kHz	appalling
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 12.5kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 50dB	excellent
Distortion	2.8%	poor
Noise, Dolby in:		
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 63dB	very good
Metal tape setting		no metal facility
Speed variations	0.1%	above average
Speed accuracy	1% fast	very poor

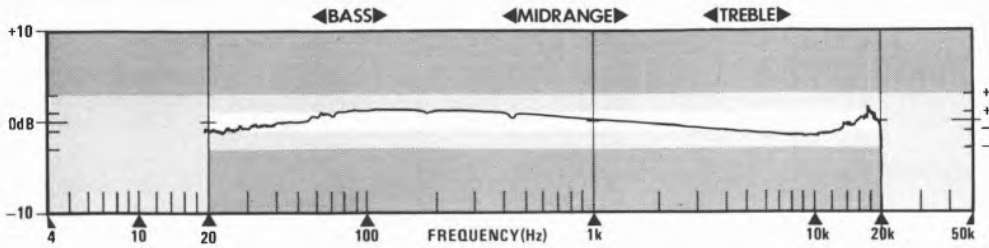
AMPLIFIER

Power output, per channel	28 watts	low power
Potential maximum volume with speakers supplied	101.5dB SPL	

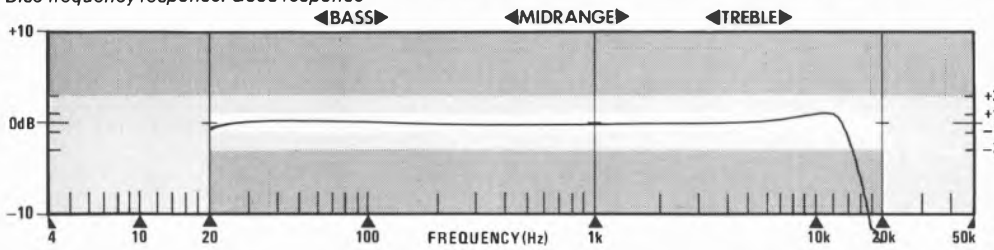
GENERAL

Rack dimensions	73cm x 91cm x 38cm
Speaker dimensions	53cm x 30cm x 26cm
Price	including speakers, £340

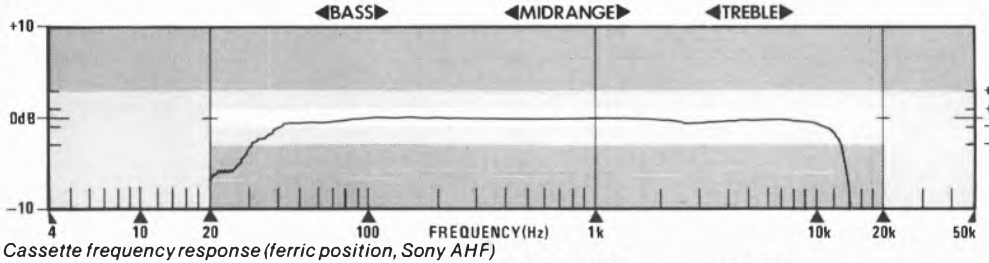




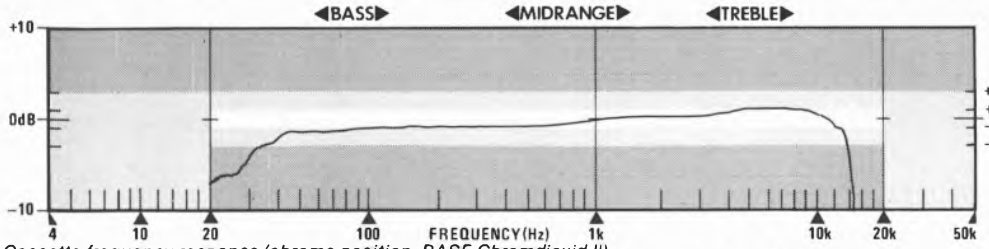
Disc frequency response. Good response



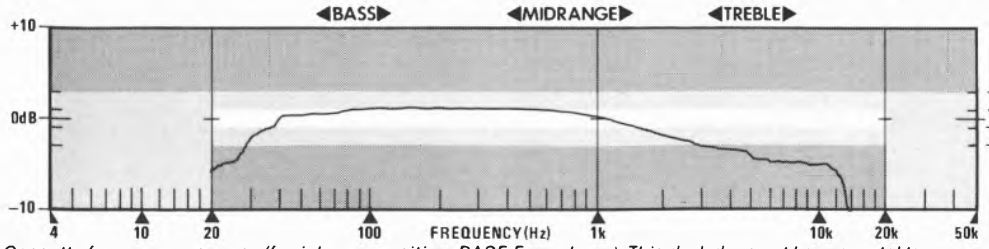
Tuner frequency response, FM. Moderately good response – see text



Cassette frequency response (ferric position, Sony AHF)



Cassette frequency response (chrome position, BASF Chromdioxid II)



Cassette frequency response (ferrichrome position, BASF Ferrochrom). This deck does not have a metal tape facility

Hitachi 2800VS

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

Hitachi have been very strong in music centres and in hi-fi separates but with the contraction of the mid-fi market over the past few years now seem to have made the transition to rack system selling. The 2800VS is currently Hitatchi's cheapest system and comes with a pair of SS-635 speakers included in the quoted price, as is the same Danish-made rack featured in the more expensive 4800 system.

The Hitachi audio rack was supplied to us in made-up form and so no comments can be made on packing, instructions or ease of assembly. The finished rack was quite stable though its castors didn't help reduce feedback from footfall with the rack on a carpeted floor. The finish was good with the use of a light teak vinyl and brushed aluminium trim.

Disc

The Hitachi HT-20S tunrtable is a belt drive model offering auto arm-return only. It comes fitted with an MT-15 cartridge, which on test produced a good frequency response trace and good tracking performance at low and middle frequencies – but suffered from a high frequency peak and limited high-frequency tracking. The motor unit resisted feedback well.

The Hitachi HA-2800 amplifier is a slimline model which on test offered a fair 36 watts into an 8ohm load. The amplifier offers limited hook-up facilities, there being no second tape input and no auxiliary input either – only tape record/playback, phono and tuner. Two pairs of speaker connections are provided however though the amp's limited ability to drive 4ohm loads suggests that above average efficiency designs with no low impedance dips should be chosen if both pairs of speakers are to be used together. Tone controls offer the conventional 8dB cut or boost at 100Hz and 10kHz in the bass and treble respectively, though the rotary controls lacked a centre detent position which would have enabled the controls to be confidently set to the 'flat' position. The loudness control was better than many with 6dB and 4dB boost in the bass and treble respectively to

compensate for hearing losses in frequency extremes with low level replay. Two LED meters are provided for output power.

Hitachi's turntable and amplifier combination was first auditioned through the reference speakers. On the orchestral test piece this combination gave a smooth even sound with gentle midband prominence and light bass. The strings, though, had a high-frequency 'edginess'. Stereo imagery was quite fair, though the image was not particularly precise and the overall sound quality warm and blurred. The rock track produced a good sound with detail and good stereo separation. The treble top end was fizzy but the bass free from boom, if lacking weight. The crossed-pair-miked chamber recording showed a good stable centre image with some information on the size and quality of the recorded acoustic. Tracking of some instruments was a shade 'spitty'. The gentle midband prominent balance didn't rob the clarinet and oboe of their rich overtone structure.

Tuner

The Hitachi FT-3500L tuner is a basic analogue tuner with a wide tuning scale and flywheel loaded tuning knob. The scale pointer carries a centre-tuner indicator which also by varying in brightness indicates signal strength – there is no signal strength meter as such. On broadcast speech, in comparison with the reference tuner, the Hitachi lacked 'weight' in male voice and 'spat' a bit in speech sibilance. Stereo image seemed less precise than the reference and this could relate to the limited high-frequency stereo separation revealed by measurement. With a live broadcast of string quartet music, the Hitachi was a shade brighter and with less 'weight' in the bass than the reference. Medium-wave reception was noise-free, though speech was somewhat 'thick'.

Cassette

The D-E10 cassette deck is a basic model with piano key transport controls and simple moving coil (needle) meters which are not backed up by a peak reading LED. Hitachi now tell us that the inclusive price we've quoted for this system includes the D-E25 model, which is an improved version of the D-E10 tested here but featuring LED metering and light touch transport controls (not solenoid) – though the basic performance should be unchanged.

The very high distortion figure we found with the D-E10 was not helped by the needle meters on this deck under-reading by 6dB at 40Hz relative to OVU at 1kHz. This fault would make it too easy to over-record music with lots of bass and produce even worse distortion figure in practice than the one we measured. The LED metering on the D-E25 should be more effective and help the user avoid over-recording.

Using Hitachi UD-EX tape, a recording was made on the D-E10 of the orchestral test disc from the reference turntable. The sound was both hissy and bright, with brass instruments being very shrill and sharp. The stereo image was pushed forward and distorted by the frequency balance. Next the rock excerpt was taped and played back for comparison with the source. The cymbals were very 'splashy', while bass lacked control and voice sounded very shrill. The whole image again was forward.

Using the ferric-equalisation orchestral pre-recorded tape, the Hitachi was auditioned against the reference cassette deck. The sound was very bright and brash with a rising treble response, yet with a lack of compensating bass weight. The image was pushed forward and detail of the recorded acoustic was lost. The chrome-equalisation rock music tape had a 'phasey' sound with a flat, forward stereo image. Though the sound was very midband-prominent in vocals and lead guitar with a hard 'edge' to cymbals there was little weight in the electric bass guitar. A poor performance then, which may be improved on the newer machine now supplied with this system.

Speakers

The Hitachi SS-635 speakers are UK-built and incorporate a Japanese 45mm paper dome/cone tweeter and a 150mm paper mid/bass driver which seems to be a Rank model. The cabinet is made from undamped 12mm chipboard and the enclosed volume contains a lump of acoustic fibre. The crossover is a simple choke and capacitor. The in-room plot for these speakers shows a fairly even trend through bass and midrange with some discontinuity between the drivers at their crossover point, though the tweeter seems to have a reasonably well maintained high frequency output.

The speakers were auditioned on the end of the reference system, first with the orchestral excerpt. The string sound was 'acerbic' and 'dry' with treble being very bright and 'fizzy'. Bottom-end response was not extended, but sounded reasonably clean in string bass and cello passages. Rock music sounded very 'brittle' and hard in the voice with 'splashy' cymbals which was a pity as the bass was quite tight and trim. The cello in the string quartet had a muffled midband quality, while the violins sounded 'scrapy' and 'wiry'. There was lots of surface noise apparent on this excerpt which helped make the overall sound thin and unpleasant. The crossed-pair-miked chamber music excerpt suffered from a distorted stereo image depth due to the frequency balance of the speakers.

The overtone structure of the clarinet, horn and oboe was emphasised causes them all to sound peepy.

Using the Hitachi turntable and amplifier with the Hitachi speakers, the orchestral test disc was tried again. The combination of the Hitachi turntable's high frequency peak and the tweeter's rather uncontrolled high frequency energy produced a 'wiry' and 'fizzy' sound that was very tiring. String-tone in particular suffered from a bright wiry colouration. The rock track exhibited lots of upper midrange and low-treble energy giving the music a 'boppy' sound quality. Bass however was clean. The solo piano track showed clean stereo imagery, and though the bass was detailed percussive and well controlled the mid and treble sounded 'clangy'.

Summary

The very mediocre fitted cartridge stands in the way of the turntable realising a good performance in this system – a replacement platter mat would help too. The amplifier and tuner gave above average performance, though the system was let down by the high distortion measured and heard on the cassette deck. Hitachi have produced an improved version of this model with better metering and transport and this could pull the system back into line. The SS-635 speakers were not kind to the high frequency performance of the fitted cartridge though with a 'smooth' sounding pickup their performance would be adequate. This system cannot really be recommended as it stands but it should be worth considering with the new cassette deck.

HITACHI 2800VS

DISC (performance via amplifier)

Frequency response	20Hz – 15kHz	good
Stereo separation	– 29dB	good
Distortion	1.2%	average
Hum and rumble	– 66dB	good
Hiss	– 75dB	above average
Speed variations	0.08%	good
Speed accuracy	0.3% fast	average
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	28Hz – 18kHz	very good
Stereo separation	– 36dB	very good
Distortion	0.8%	below average
Minimum noise	– 74dB	excellent
Aerial signal for minimum noise	1.6mV	below average
Selectivity between stations	76dB	excellent
Sensitivity, mono	4uV	poor
Sensitivity, stereo	44uV	poor
Signal strength meter levels	– none	

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

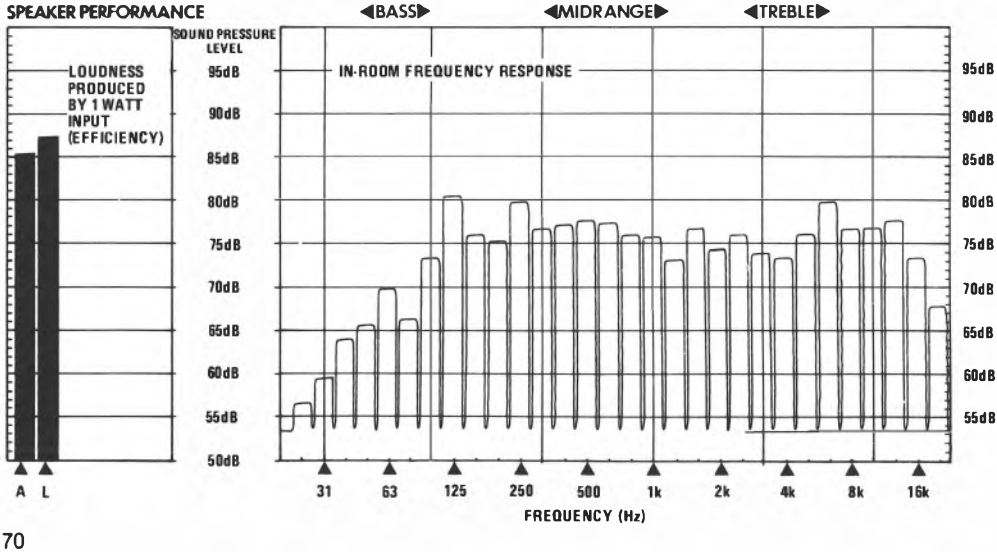
Ferric or Normal tape setting	Hitachi UDER	
Chrome tape setting	Hitachi UDEX	
Metal tape setting	Hitachi UDME	
Frequency response, record/replay:		
Ferric tape setting	60Hz – 8kHz	poor
Chrome tape setting	60Hz – 4kHz	very poor
Metal tape setting	60Hz – 12kHz	average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	90Hz – 12.5kHz	very good
Chrome tape setting	90Hz – 8kHz	average
Stereo separation	– 34dB	below average
Distortion	6.6%	very poor
Noise, Dolby in:		
Ferric tape setting	– 56dB	below average
Chrome tape setting	– 60dB	typical
Metal tape setting	– 58dB	typical
Speed variations	0.07%	good
Speed accuracy	0%	excellent

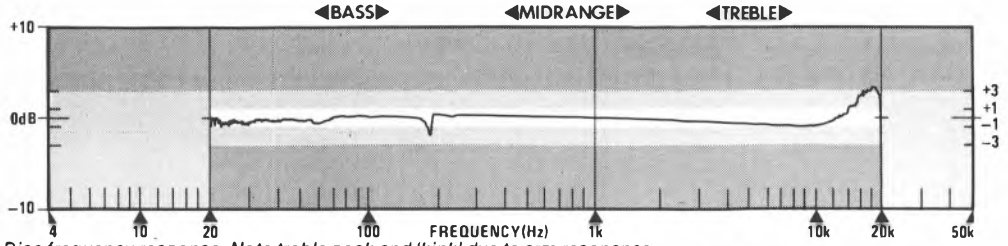
AMPLIFIER

Power output, per channel	36 watts	medium
Potential maximum volume with speakers supplied	103.5dB SPL	

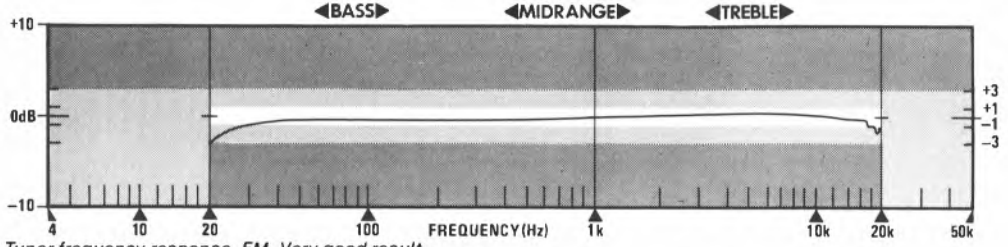
GENERAL

Rack dimensions	95cm x 60cm x 40cm
Speaker dimensions	42cm x 27cm x 21cm
Price	including speakers, £330

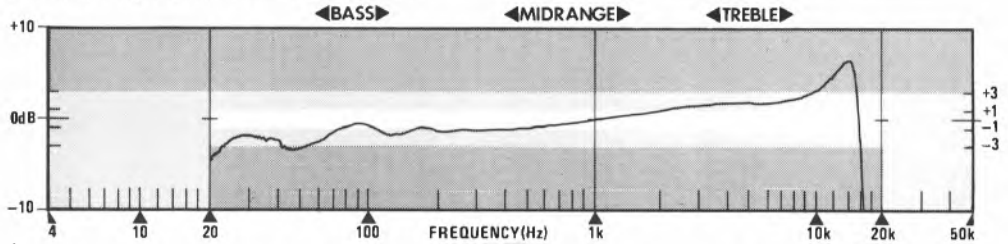




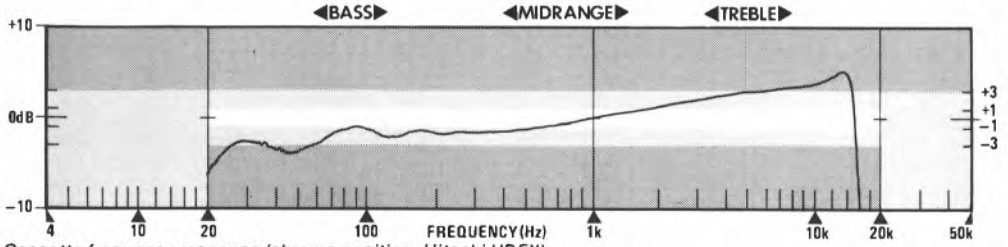
Disc frequency response. Note treble peak and 'kink' due to arm resonance



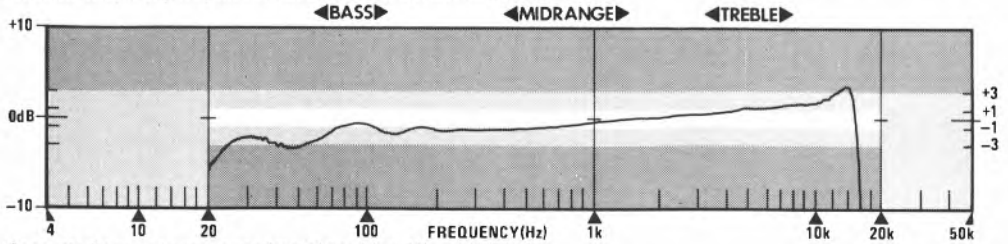
Tuner frequency response, FM. Very good result



Cassette frequency response (ferric position, Hitachi UDER)



Cassette frequency response (chrome position, Hitachi UDEX)



Cassette frequency response (metal position, Hitachi UDME)

Hitachi 4800

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

Hitachi's up-market rack system offers a bigger amplifier and more facilities, and is compatible with an optional-extra remote control. It is reviewed here without speakers, which are also optional. The audio rack which is part of the system was delivered made-up by Hitachi and is suitable for both this system and the 2800VS reviewed previously. The rack is of Danish manufacture and uses a light shade of wood-effect vinyl with neat aluminium trim which makes it both sufficiently 'different' and of good enough quality to be paired with a fairly expensive system. Structurally strong, the rack is fitted with castors which may be domestically acceptable but do in general tend to make racks prone to turntable feedback problems from footfalls on a carpeted floor.

Disc

Hitachi's policy over turntables as seen in the two racks submitted to *Choice* is confusing. Though the two systems are over £200 apart in cost, their turntables have very similarly-designed tone arms and identical cartridges. The HT-50S turntable is a direct drive version of the 20S model, though speeds are quartz locked rather than offering pitch control and strobe adjustment. The arm on the 50S seems to be a cosmetically-improved version of that fitted to the 20S and is of the straight wand type. On the test bench the arm resonance 'hiccup' at 200Hz found with the cheaper arm is absent on the 50S model, though the cartridges exhibit the same high frequency peak. The 50S motor unit was speed accurate and suffered very little from drift.

The Hitachi HA-4800 amplifier is a neatly styled slimline amp having a switchable moving magnet/moving coil phono input (the mc setting, having a 0.25mV input sensitivity and 100ohm load impedance is suitable for most 'low output' moving-coils). In addition to the tuner and auxiliary inputs, the HA4800 has full dubbing facilities for two tape decks and connections for two pairs of loudspeakers, to be run together or separately. Bass and treble tone controls offer 8dB cut or boost at 100Hz and 10kHz

respectively but there is a 'tone defeat' which switches their circuits out to improve the sound quality when they are not required. A loudness control offers treble and bass boost to compensate at low levels for the ears' lost sensitivity in the frequency extremes. The subsonic filter rolls off at 20Hz but its gentle slope means it is not of great help for feedback or rumble problems.

The Hitachi turntable and amplifier combination was fed through the reference speakers for the first listening tests on the orchestral test piece. The sound was smooth, warm and veiled in the midband with some sense of a high frequency 'peakiness' in brass and string tone. Imaging was fair but the brass was at times muffled and lost. The rock track had a flat tonal balance except for a 'zippy' edge to cymbals from the high frequency peak which surprisingly didn't make vocals sibilant – they sounded bright but not 'whistly' or distorted. The sound in the lower mid and bass was oddly muffled with the bass guitar line confused. The crossed-pair mike-chamber music excerpt had an indistinct image and the tracking of transients was a bit suspect.

Tuner

Hitachi's FT-4500L is a true digitally synthesised tuner with automatic scanning of all three wavebands and six presets with one FM and one AM station on each. The presets switches are back-lit perspex blocks which work well as indicators of the chosen preset. In use the auto-scan was thought to be rather slow operating, while the signal-strength meter needed more than three segments to be of any real use particularly as the chosen sensitivities were so high.

On broadcast speech in comparison with the reference tuner the Hitachi FT-4500L was found to be lacking the weight in chest tones of male voice. The Hitachi additionally sounded brighter than the reference with a barely-noticeable smeared sibilance in speech. With broadcast music the Hitachi sounded a touch busier in the treble than the reference with an apparent gentle presence lift giving emphasis to the diction of sung material that was smoother on the reference. The tuner measured well in every respect on the test bench and produced a ruler-flat frequency response with the gentlest tilt favouring treble over bass. Overall the sound was very close to the reference and judged very good indeed.

Medium wave reception using the Hitachi's loop aerial was compared with the reference and found noise-free, though slightly less clear in speech then the reference, if care was taken to site the loop properly.

Cassette

The Hitachi D-E55 cassette deck is flashed on the fascia as having a computer mechanism but this only refers to the deck's ability to rewind to stop or rewind to auto-play after recording, to repeat play, or to rewind to the position on the tape where playback was engaged. This last feature is in many ways better than a counter memory as it doesn't rely on the user remembering to set the counter to 000 at the beginning of play. Tapes can be auto-played up to 16 times, then the machine switches off.

The D-E55 deck has wide-range LED peak metering with a record level control for both channels together and a record balance between the channels rather than independent left and right channel controls. The record balance is a good control and the overall record level control allows perfect fades. Good head access could be had for head cleaning though there was no light in the cassette compartment. The back panel of the D-E55 is fitted with both DIN and phono sockets, and also with a socket for remote control and a output level potentiometer which allows the user to get record/replay levels properly adjusted if he/she changes a cartridge in this system or needs to match the cassette deck with another amp.

On the test bench the D-E55 gave poor results with the recommended ferric tape type though the treble extension on both chrome and metal positions with the recommended tape type was excellent. The tape head seemed to create a lot of bass distortion on test.

Using Hitachi ME tape with the MPX filter switched out the orchestral test track was taped on the D-E55 from the reference turntable through the Hitachi amp and was played back for switched comparison with source. The tape showed very slight frequency imbalance only being very close to the source. The stereo image seemed a bit centrally-confined and smeared, though this and the hiss level were the only immediate clues to the fact that we were listening to tape not the source. On the rock test track the Hitachi produced very good results though bass was a bit 'woofy' and soft. Treble seemed drier in cymbals and voice than the source and stereo imagery seemed again less deep and cruder.

Using the orchestral ferric-equalisation pre-recorded test tape the Hitachi was compared on pre-recorded cassette replay against the reference cassette deck. The Hitachi sounded both brighter and thinner than the reference with a rather sharp treble quality while the bottom end orchestral weight was missing leaving the sound hanging in the air as it were. The chrome rock tape was brighter and lacked bottom end weight in drums and electric bass while the

vocals were found to be rather papery.

Summary

Though it seemed odd that Hitachi should have fitted the same budget cartridges to both their £550 and £350 system turntables it did provide an ideal opportunity to audition the two turntables side by side through the reference amplifier and speakers. The high frequency peak noted on the 50S turntable seemed still to be there which suggests this is a cartridge problem. The 50S turntable quite definitely sounded more muffled and cloudy in the important midtones, and while its bass was less boomy than the cheaper 20S it lacked the belt drive model's smack and impact. It does seem that the cheaper 20S is preferable on sound quality.

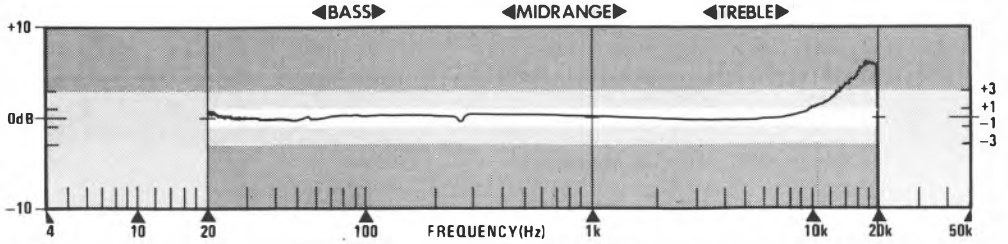
The amplifier in the Hitachi system, though producing a high 66 watts on the test bench, only managed 49 watts into a 4ohm load! This early limiting of power was due to asymmetric clipping of the output waveform. This result suggests that speakers with low impedance dips should be avoided and that the amp's performance will be limited with even two pairs of 8ohm speakers running together.

The tuner produced exemplary results though the cassette deck had a few minor problems. The D-E55 cassette deck's bass distortion has already been mentioned but it should be noted that the LED meter display under-reads by – 5dB at 40Hz which will encourage users to turn up the record level with bass heavy music – such over recording will only aggravate the bass distortion problem.

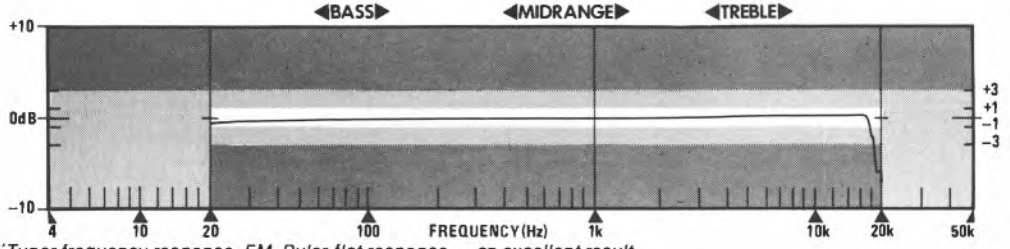
In view of this system's price without speakers, it cannot be said to offer good value with the limitations of the 50S turntable and its budget cartridge, and with the amp and cassette problems noted.

HITACHI 4800

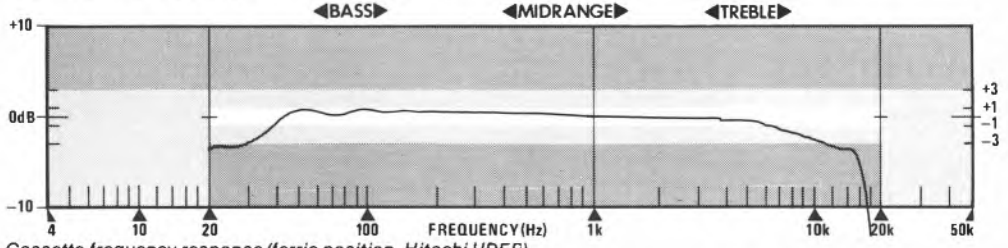
DISC (performance via amplifier)		
Frequency response	20Hz – 10kHz	average
Stereo separation	– 26dB	above average
Distortion	1.2%	average
Hum and rumble	– 67dB	very good
Hiss	– 78dB	excellent
Speed variations	0.06%	very good
Speed accuracy	0.1% fast	excellent
Tracking ability	20cms/sec	good
TUNER (performance via amplifier)		
Frequency response	20Hz – 18kHz	very good
Stereo separation	– 43dB	very good
Distortion	0.3%	above average
Minimum noise	– 72dB	very good
Aerial signal for minimum noise	1mV	average
Selectivity between stations	80dB	excellent
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	30uV	average
Signal strength meter levels (1) 8uV (2) 25uV (3) 32uV		
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Hitachi UDER	
Chrome tape setting	Hitachi UDEX	
Metal tape setting	Hitachi UDME	
Frequency response, record/replay:		
Ferric tape setting	30Hz – 8kHz	poor
Chrome tape setting	35Hz – 16kHz	very good
Metal tape setting	35Hz – 17kHz	very good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	60Hz – 12.5kHz	excellent
Chrome tape setting	60Hz – 12.5kHz	excellent
Stereo separation	– 45dB	very good
Distortion	4%	bass distortion
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 62dB	good
Metal tape setting	– 61dB	very good
Speed variations	0.08%	good
Speed accuracy	0.6% fast	below average
AMPLIFIER		
Power output, per channel	66 watts	high power
GENERAL		
Rack dimensions	119cm x 49cm x 39cm	
Price	without speakers, £540	



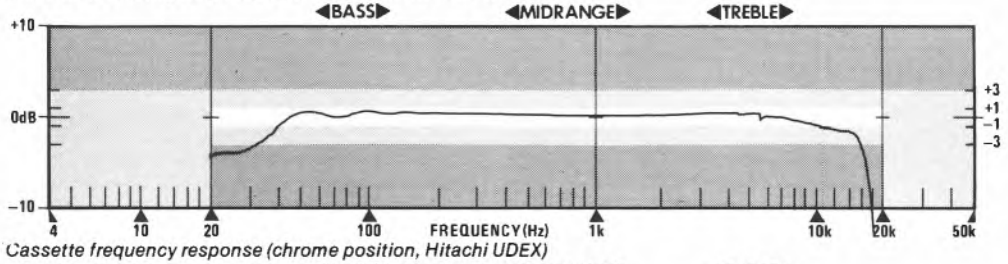
Disc frequency response. Note sharply-rising treble response



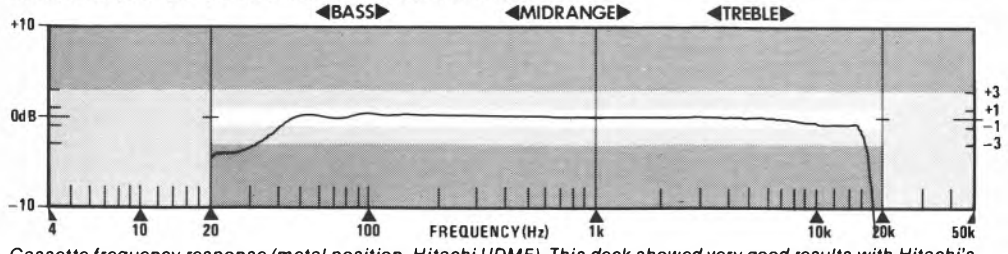
Tuner frequency response, FM. Ruler-flat response – an excellent result



Cassette frequency response (ferric position, Hitachi UDER)



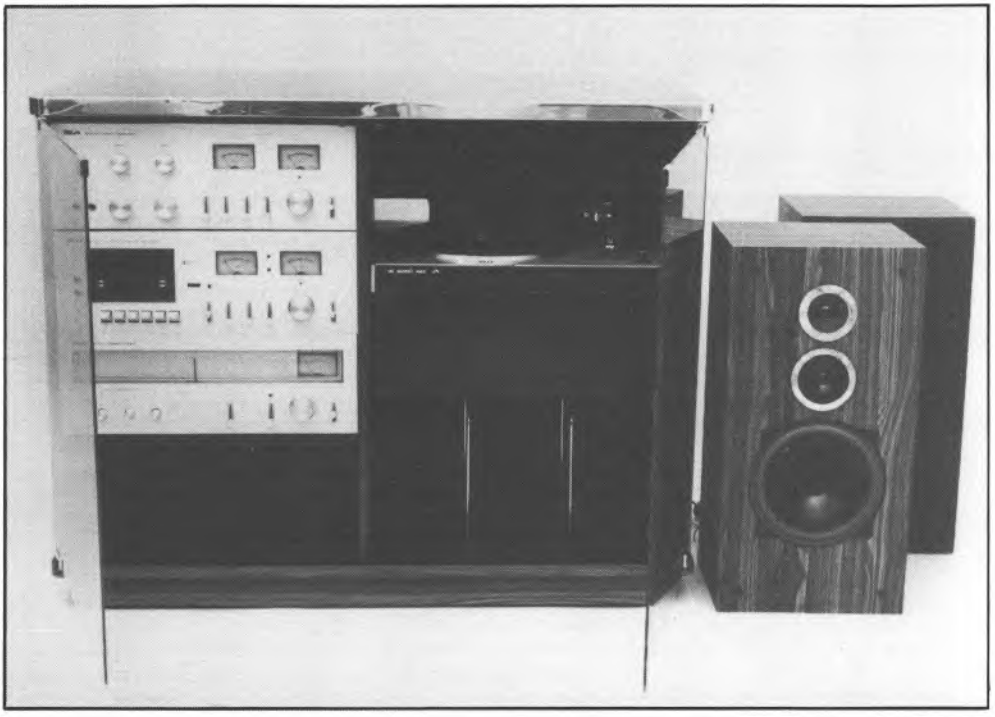
Cassette frequency response (chrome position, Hitachi UDEX)



Cassette frequency response (metal position, Hitachi UDME). This deck showed very good results with Hitachi's own tape types

HMV 8000H

Intersound Electronics Ltd, Victoria Road, Willesden, London NW10 6ND
Tel 01-965 8771



Intersound Electronics, with the familiar 'His Master's Voice' brand name, offer the only system under test in this book to be designed and built in the UK. The 8000 is supplied with either a horizontal or vertical rack, the 8000V 'vertical' system costing £545.

A substantial 'sideboard' with double glass doors, the 8000HR rack comes stoutly packed with clear unpacking instructions – it is however very heavy indeed, containing three large pieces of glass. The instruction booklet for the rack contained a confusing addendum but no mention was made of the necessity to identify left and right hand parts. No pre-assembly was done for the customer and so basically simple assembly was tedious. The finish was in a rather mediocre wood-effect vinyl with a chromed strip around the black glass top. The tiny strips of glass in the sides were difficult to fit and, we felt, added little to the design.

Disc

The HMV 8000P turntable is simply a 'badge-engineered' BSR Quanta turntable, fitted with a Shure M75-6 cartridge in place of the ADC model which was originally fitted as standard and to which the instruction booklet still alludes. The turntable is a distinctive design with tall isolating feet and a suspended subchassis on which platter and arm are mounted. The platter is rotated by a two speed direct drive motor with servo control, which allows pitch adjustment with the rotary control to the left of the plinth and the strobe window in front of the platter. Rotary controls to the right of the plinth are for speed change and 'reject' for the semi-automatic arm. The motor unit provided very good measurements on test though the cartridge showed higher than average distortion and a poor frequency response trace with a fairly deep suckout in the treble and a high frequency peak.

A bulky design, the HMV 8000A amplifier offers a disc, tuner, one tape and one auxiliary input and outlets for two pairs of speakers, which can be used separately or together. Volume and balance controls are twin con-

centric knobs below the needle-type meters for left and right channel power output. Treble and bass controls are conventionally engineered with 10dB cut or boost at 100Hz and 10kHz. Confusingly, the scratch filter is marked on the front panel as having 7kHz and 10kHz turnover frequencies yet the instruction booklet states that the curves for the two available settings are respectively −6dB and −3dB at 10kHz, which seems contradictory.

Equally confusingly, the rumble filter is marked 30Hz and 60Hz – either is far too severe to cut rumble without seriously affecting the musical signal as well! The loudness switch gives combined bass and treble lifts of 6dB each at 100Hz and 10kHz or presumably 6dB at 100Hz.

The first sample of the amplifier proved faulty. A second, checked, sample produced very high levels of hum which were easily heard through the system at all times. With the reference speakers the HMV system was set up and auditioning began with the orchestral test piece. Imagery was over deep due to the falling treble response of the cartridge. The sound was quite detailed, if obviously short of treble.

Rock music sounded boxy with leaden cymbals and a confused cardboardy bass quality. The crossed-pair recording was ruined by the intrusive hum and though lateral imagery was fine the image depth was again enhanced by the frequency balance.

Tuner

The 7000T tuner is technically well behind the current Japanese production models in this price band. The HMV model has only a 300ohm balanced aerial input which will tempt users to stick with an inadequate dipole aerial instead of getting a balun transformer for a 75ohm unbalanced feed from a good roof aerial. There is no interstation mute fitted, as automatic frequency control (AFC) is selected on the front panel once the station is tuned. The execution of the tuning knob, tuning scale and signal strength meter design could hardly have been worse. The tuning scale was badly printed and its pointer inaccurately aligned. Tuning action was lightweight and sloppy. The signal strength meter despite having a 0-10 scale could only give a 4.5 deflection for even a 5mV input.

On broadcast speech the HMV tuner sounded smooth in the midband, but forward and with a 'spitty' edge in comparison with the reference. On a violin concerto the 7000T suffered from hiss and interference whistles (on test it showed poor selectivity for alternate channel 400Hz above the tuned frequency which suggests that in use it will suffer breakthrough problems from stations above the tuned frequency).

The tuner sounded muddled in the bass but seemed to have a flat if forward midband response, the problems on this broadcast being due to noise and distortion. Medium wave had a thickened quality but generally good sound.

Cassette

The HMV 8000C cassette deck has the same deep styling as the other items in this system. The piano key transport controls proved stiff and head access was difficult to achieve for cleaning – a cassette-type head cleaner is a must for this model. The moving coil VU meters under-read and should have been supplemented by at least one peak LED. The counter memory facility is a useful extra.

Tape type recommendations suggest an almost total lack of awareness of the tape market development over the past five or so years as many of the recommended types are either obsolete or haven't been sold for years – TDK KR for instance. Additionally, the recommendation of TDK D, AD and Maxell UD for the ferric position shows the manufacturer to have no concern that these types require completely different bias levels.

On the test bench we found the ferric bias to be set very low and suitable only for 'cooking' cassettes, being too low even for TDK D! Metal tape compatibility was very poor. Overall, bias levels were on the low side for all three selector positions.

Using Philips Ultra Chrome tape the cassette deck was used to tape extracts from disc and replay them for comparison with the source. The orchestral test piece had a very forward treble quality and was noisy but the sound quality was fair. On rock material the cassette deck showed a flabby bass quality with a lack of treble 'air' and detail of reverberation. The treble boost brought the sound image forward, yet the sound lacked very high frequencies.

On pre-recorded tapes, the 8000C had a nasal reedy flute tone on the ferric orchestral piece and sounded thin, lacking bass weight. The chrome rock tape lacked sparkle and had a bass sound lacking both power and definition. A fair performance only.

Speakers

The HMV 8000S speakers are finished in a vivid vinyl veneer with tatty chromed rings applied to the drivers. The cabinet is made in 14mm chipboard and houses an 180mm paper bass unit, a 75mm plasticised paper midrange unit and a 19mm plastic dome tweeter loaded by a shallow horn. An 8 element crossover integrated the drivers. The initial silence from one speaker was traced to a faulty DIN plug on one lead.

The in-room plot seems to show a lack of driver integration at the 1k and 6k crossover

points and a lack of treble above the 9kHz peak.

Auditioning the speakers on the reference system showed up a 'papery' treble colouration with a booming bass quality and midrange boxiness noted in string tone. On the rock track the speakers had oddly coloured leaden cymbal crashes, and a sound which lacked both power and bass weight. The string quartet was spoiled by 'paper-and-comb' treble in the strings while the crossed pair chamber recording showed fair imaging properties but had a curious hollow resonant colouration in the upper mid. There was no 'air' or openness. Replacing the reference equipment with the HMV turntable and amplifier, the orchestral test piece sounded smoother in the treble yet had a dull, 'murky' midband sound with a boomy bass. Rock was hollow and boxy, sounding very coloured, while solo piano music lacked dynamics and sparkle in the right hand passages. Bass was muddled.

Summary

The HMV-branded turntable provided the potential for above average sound quality but the HMV amp did not capitalise on this, sounding coarse and boomy in the bass when driven hard in the reference system. More seriously the amplifier suffered from noisy hum and was poorly built. The tuner was well below average in both facilities and sound quality. The cassette deck too offered only a reasonable performance which would not be realised by the customer if he stuck to the tape recommendations made by the manufacturer.

This system falls short of the mark in so many respects that recommendation cannot possibly be made.

HMV 8000

DISC (performance via amplifier)

Frequency response	20Hz – 4kHz	poor
Stereo separation	– 33dB	very good
Distortion	1.7%	below average
Hum and rumble	– 63dB	below average
Hiss	– 70dB	poor
Speed variations	0.07%	very good
Speed accuracy	0%	excellent
Tracking ability	16cms/sec	average

TUNER (performance via amplifier)

Frequency response	40Hz – 15kHz	above average
Stereo separation	– 30dB	good
Distortion	0.5%	average
Minimum noise	– 67dB	above average
Aerial signal for minimum noise	1.2mV	average
Selectivity between stations	50dB	very poor
Sensitivity, mono	8uV	into 300ohms – poor
Sensitivity, stereo	100uV	into 300ohms – poor
Signal strength meter levels (2) 200uV (4.5) 5mV		

CASSETTE (performance via amplifier)

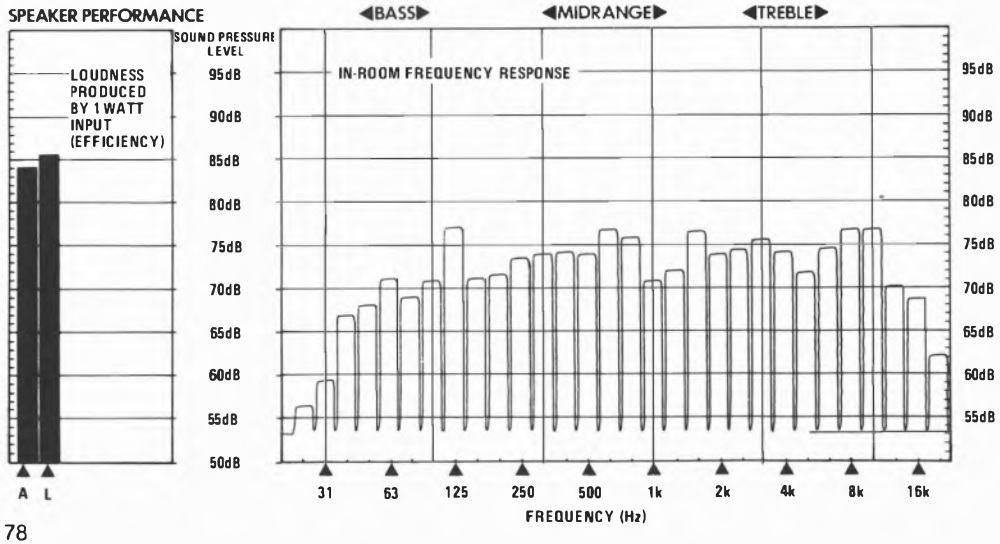
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Philips Ferro	
Chrome tape setting	Philips Ultra-Chrome	
Metal tape setting	Scotch Metafine	
Frequency response, record/replay:		
Ferric tape setting	28Hz – 9kHz	below average
Chrome tape setting	28Hz – 15kHz	good
Metal tape setting	28Hz – 3kHz	appalling
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	80Hz – 12.5kHz	good
Chrome tape setting	80Hz – 12.5kHz	good
Stereo separation	– 39dB	very good
Distortion	3.2%	poor
Noise, Dolby in:		
Ferric tape setting	– 53dB	very poor
Chrome tape setting	– 59dB	typical
Metal tape setting	– 58dB	typical
Speed variations	0.05%	excellent
Speed accuracy	0.5% fast	below average

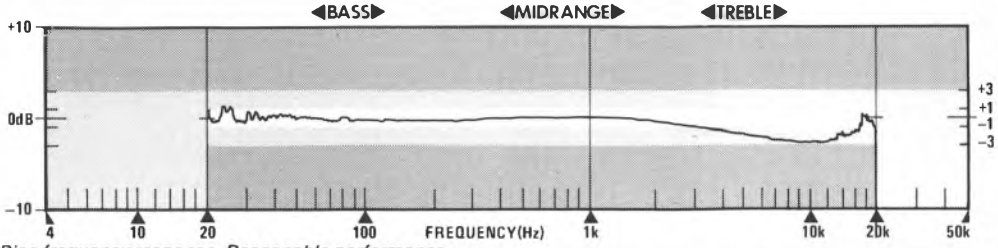
AMPLIFIER

Power output, per channel	32 watts	medium power
Potential maximum volume with speakers supplied	102dB SPL	

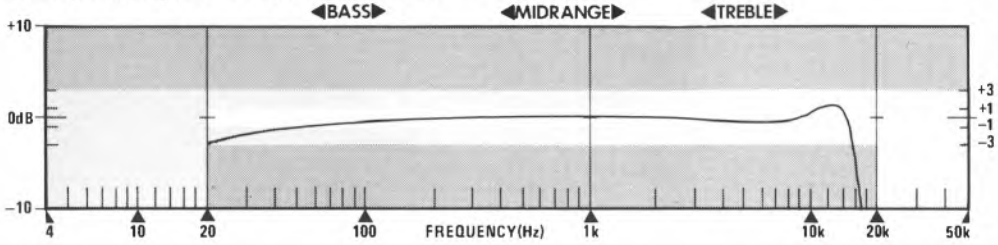
GENERAL

Rack dimensions	98cm x 80cm x 46cm
Speaker dimensions	57cm x 28cm x 23cm
Price	including speakers, £595

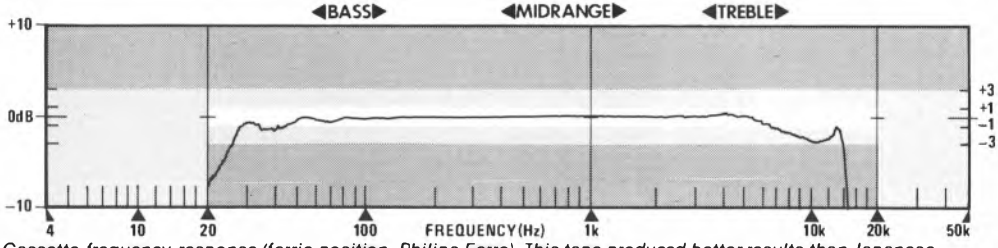




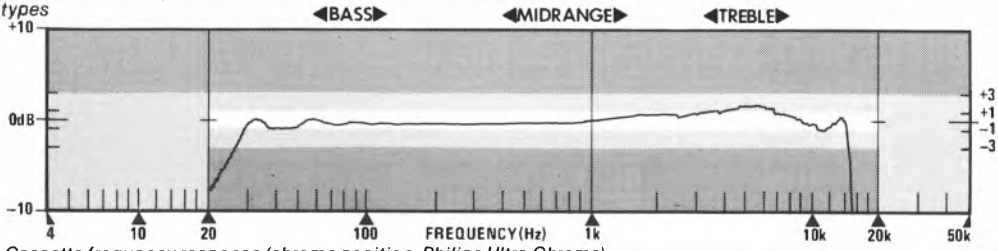
Disc frequency response. Reasonable performance



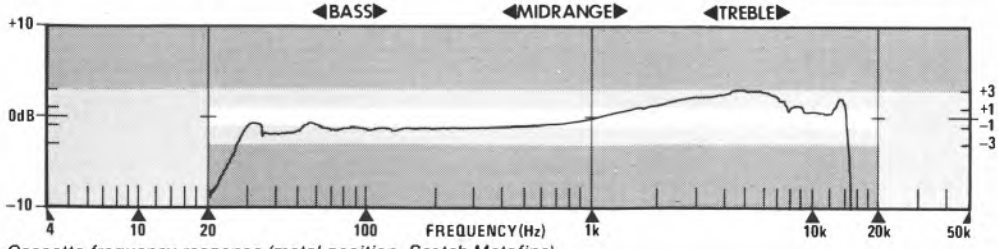
Tuner frequency response, FM. Quite well extended treble response



Cassette frequency response (ferric position, Philips Ferro). This tape produced better results than Japanese types



Cassette frequency response (chrome position, Philips Ultra Chrome)



Cassette frequency response (metal position, Scotch Metafine)

Inkel Remote Control

Inkel Ltd, 1 Salop Close, Shrivenham, Swindon, Wilts
Tel (0793) 612701

Inkel is a very new name to the UK audio market; their equipment is imported from the Dongwon Electronics Company in Korea. The Inkel Remote Control System was supplied to us with no speakers but with an Inkel RS2 hi-fi rack. We were not able to obtain a rack in time for auditioning and this for convenience was carried out with the equipment installed in the Rotel RK-150 rack. An RS2 rack did come in time for photography and was well packed. The supplied instructions were fair but could have been clearer. The rack should prove easy to assemble but unfortunately our sample was supplied with two tops instead of one shelf and a top so we could not fit the back panel properly or the door. Again we can't really comment of the rack's stability as the back could not be fitted but as it fits into grooves in the sides, plinth and shelf the assembled rack should be strong. The rack has a half door only but there are no record dividers in the bottom compartment; the finish was uninspiring. An alternative metal rack should also be available.

Disc

The Inkel DD-40 turntable is a servo-controlled-motor belt-drive model offering pitch control and auto arm return only. The plinth was quite substantial and proved reasonably resistant to feedback howl while the turntable, cartridge and phono input of the Inkel amp were hiss-free. The cartridge fitted to the straight arm of the DD-40 is an OEM Audio-Technica model with a one piece moulded plastic cantilever. On the test bench this cartridge produced an undulating frequency response trace but the bumps and dips were gentle, keeping the trace within 1dB limits across the audio spectrum. The distortion figure for the cartridge was not good but a fine tracking performance was recorded.

Inkel provide a 45 rpm adaptor and headshell stand for spare headshells both at the back of the plinth but I've yet to work out why their instruction leaflet shows a standard SME type spare shell when the arm accepts the low mass plug-in type of shell only!

The AD-20 amplifier looks marvellous but

proved less easy to use than expected. The centre of the amp is taken up by the remote control infra-red sensor and 'received' light, which will be covered later in the review. The volume control is on a slip clutch and though smooth was quite stiff to turn. The clutch is necessary as the control itself is motorised and rotates when the remote control volume up/down controls are pressed. It was the block of function switches that caused problems as they only light up once selected and to find the source selector you want you have to peer for the legend engraved on the back side of a darkened piece of transparent plastic.

The amplifier offers basic hook-up facilities only for a tuner, a disc input and one tape deck – there is no second tape input and no auxiliary input either though surely the 'speaker off' switch could have been used instead for an auxiliary input selector and its speaker mute function transferred to the headphone socket, as with many other designs. The tone controls offered the usual 10dB cut or boost at 100Hz in the bass and 10KHz in the treble though the loudness seemed better than usual with 7dB in the bass and only 2.5dB boost in the treble. The balance control was good.

The Inkel turntable was played through the AD-20 amplifier into the reference speakers for the first listening test. With the orchestral test track the Inkel equipment produced a midband-forward sound with a spiky high frequency content which made brass instruments sound shrill and unpleasant. On the rock track the sound of guitar was hard in the top with a boomy bass from electric bass guitar and the vocal line pushed forward in the image. The sound on this track was confused and lacked dynamic extension as though the amp were not powerful enough.

On the crossed-pair-miked chamber music excerpt, the Inkel equipment produced an ill-defined stereo image with little sense of depth. The flute had a 'peeping' top end sound while all the instruments seemed to be set in a hazy high-frequency halo. The imaging benefits of simple crossed-pair-miking were not realised by this combination. On pure tones the turntable seemed to wow though the test results don't suggest this would be audible.

Tuner

Closely matching the amplifier's styling is the TD-10L tuner, the centre window now fitted with a signal-strength meter doubling as a tuning meter for the presets, being marked in MHz. The tuner is an 'analogue' model with tuning knob and scale though the scale has been designed to fit in half the length of the fascia for styling reasons. On the far right of the tuner are the bank of presets and memory button which enables seven FM and seven AM stations to be stored in the presets.

In operation the tuning scale pointer is not illuminated until the tuning knob is touched which proved mildly irritating, but the tune window and scale calibration seemed way out – Capital Radio broadcast on 95.8MHz, would appear on the scale anywhere between 95.0 and 95.5MHz, but no nearer to its true frequency than that. The flywheel behind the tuning knob didn't help much, being rather stiff.

On broadcast speech, the Inkel tuner sounded more noisy than the reference tuner and lacked weight in chest tones in male voices, sounding edgy too in transients. On baroque songs with lute and harpsichord the Inkel sounded 'drier' than the reference lacking the smoothness of the latter's sound though appearing to have quite a flat response nevertheless. It was again noisier with lots of hiss.

Cassette

The Inkel CD-30 cassette deck has soft-touch transport controls – these are the block of transparent buttons on the bottom right of the fascia. The other buttons are the tape selector for ferric, chrome and metal combined bias-and-equalisation settings. Memory and Dolby noise reduction switches are here too but have no lights and it proved very difficult to see which switch was depressed. The record level controls are the two vertically arranged knobs right of centre – it was quite hard to get an even fade in both channels with these knobs. The VU meters are moving coil type with a compressed scale and no peak-reading LED backup.

Test bench measurements showed that the ferric tape setting produced poor results yet chrome and metal tape settings produced very good frequency response plots. The cassette transport showed up as being slightly slow though there was little speed drift. As the standard tests only use the left channel (the worst channel on a cassette recorder being the outside edge of the tape always) it was not discovered until stereo listening tests were carried out that the cassette deck was wired out of phase internally and produced a diffuse sound image. This was corrected by reversing the polarity of one of the reference speakers but this type of fault should never be allowed to appear in a machine on the market.

Using Scotch Master II tape the orchestral test piece was taped and replayed for comparison with the original source. The sound was slightly trebly, but not peaky. In treble transients however the cassette and amplifier combination sounded distorted with a 'ripping' quality. Midband was indistinct while the image

was rather distant.

On the rock excerpt the guitar was trebly and cymbals too 'swishy'. The whole sound lacked focus and sounded confused. Pre-recorded tape replay of the ferric test tape sounded marginally slow with little bass weight and a very forward presence which lost most of the ambience information on this tape. The rock track was fatiguingly bright with little bass extension or weight.

Remote

The amplifier carries the remote receiver and is connected to the tuner, turntable and cassette deck through flat cable having sockets and plugs which couldn't be confused. The hand controller gives control of power, source selection, preset station selection on the tuner, cue and reject on the turntable and full control of the cassette transport functions.

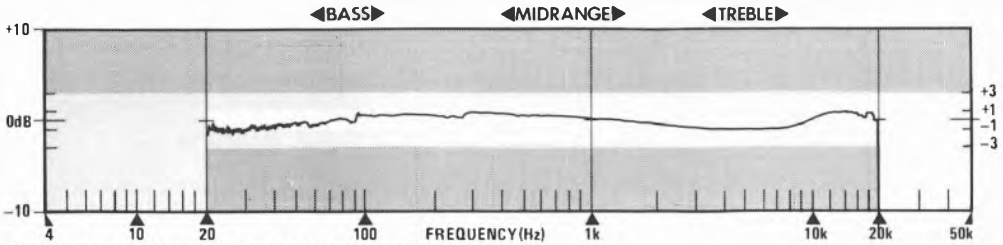
Summary

The Inkel Remote Control System seemed to have sacrificed easy operation for marketable styling. The turntable proved fair but when the amp was auditioned in isolation with the reference equipment it sounded thick in the mid and bass with the distinctive 'tearing' treble quality referred in the cassette comments. On test the amp delivered a good 40 watts into an 8ohm load but managed nowhere near double this into a 4ohm load, producing just 50 watts – hence the lack of a second pair of speaker outlets?

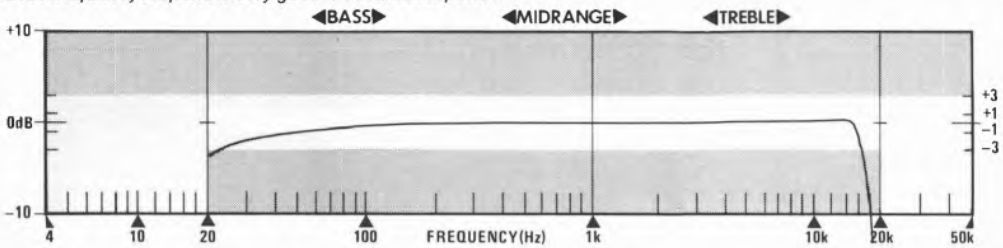
The tuner sounded edgy and noisy and was not too easy to operate manually while the cassette deck proved unsatisfactory with ferric tapes and very bad on pre-recorded tape replay, which was offensively bright with no bass extension. Even taking into account the benefit of remote control the Inkel does not provide the sound quality or operational ease to be recommended at this price.

INKEL RC

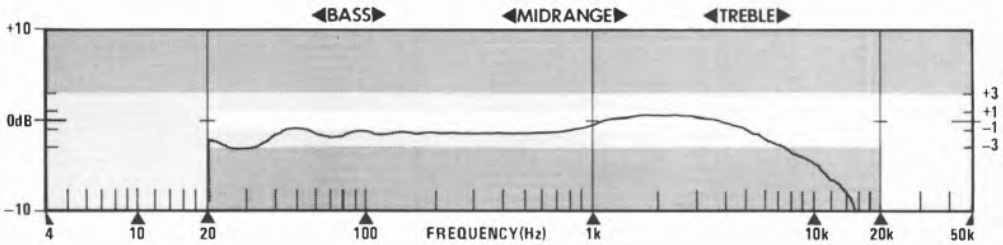
DISC (performance via amplifier)		
Frequency response	20Hz – 20kHz	excellent
Stereo separation	– 26dB	good
Distortion	1.6%	below average
Hum and rumble	– 66dB	good
Hiss	– 78dB	excellent
Speed variations	0.14%	below average
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	good
TUNER (performance via amplifier)		
Frequency response	40Hz – 16kHz	good
Stereo separation	– 48dB	excellent
Distortion	0.3%	above average
Minimum noise	– 64dB	poor
Aerial signal for minimum noise	630uV	average
Selectivity between stations	73dB	very good
Sensitivity, mono	3uV	average
Sensitivity, stereo	50uV	very poor
Signal strength meter levels (1) 2.5uV (3)	16uV (5) 400uV	
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	Scotch Master II	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	35Hz – 7kHz	poor
Chrome tape setting	20Hz – 17kHz	very good
Metal tape setting	35Hz – 18kHz	very good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	45Hz – 2kHz	excessive treble
Chrome tape setting	45Hz – 1.2kHz	excessive treble
Stereo separation	– 50dB	excellent
Distortion	3%	below average
Noise, Dolby in:		
Ferric tape setting	– 60dB	good
Chrome tape setting	– 63dB	very good
Metal tape setting	– 59dB	typical
Speed variations	0.06%	very good
Speed accuracy	0.4% slow	average
AMPLIFIER		
Power output, per channel	40 watts	medium power
GENERAL		
Rack dimensions	59cm x 46cm x 38cm	
Price	without speakers, £440	



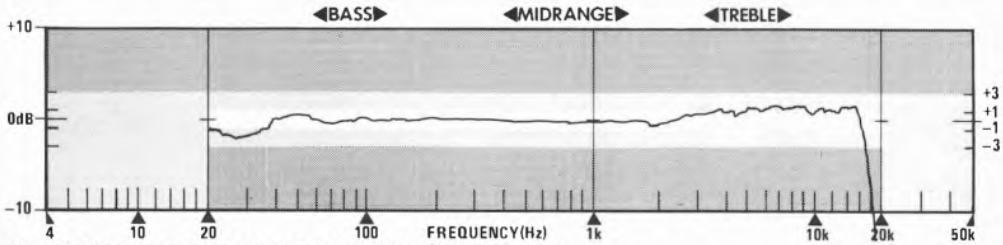
Disc frequency response. Very good measured response



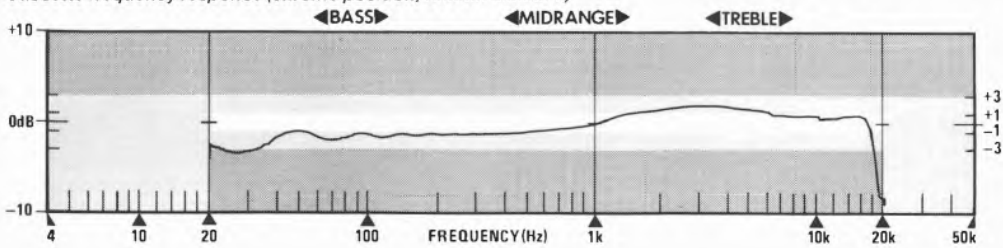
Tuner frequency response, FM. Good response



Cassette frequency response (ferric position, Maxell UDXL i). Note falling treble



Cassette frequency response (chrome position, Scotch Master II)

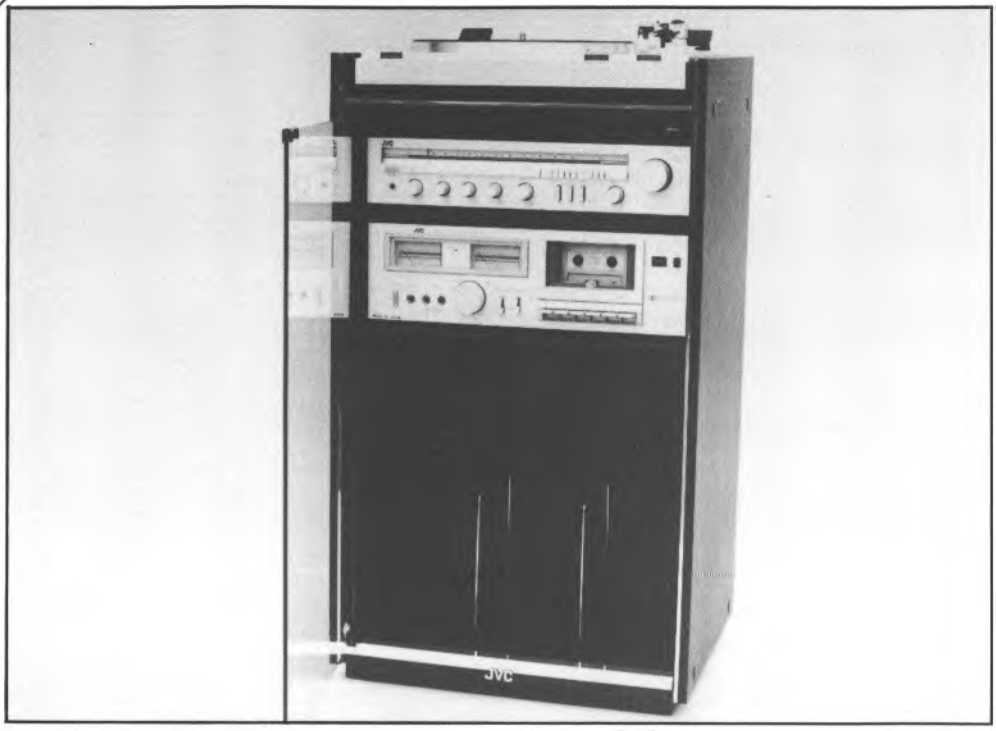


Cassette frequency response (metal position, TDK MA)

BEST BUY

JVC GR100

JVC (UK) Ltd, 6-8 Priestley Way, Eldonwall Trading Estate, Staples Corner, London NW2 7AF
Tel 01-450 2621



JVC's budget anchor-point system is a receiver-based rack, the GR100, which was supplied without loudspeakers for this review. The LK-G042B audio rack was delivered with good packing and fairly well detailed instructions for assembly – additional notes were taped to the components concerned if specific problems were likely to be encountered. Assembly was easy, there being much pre-assembly done for the customer, and the parts were numbered. Stability of the finished rack was fair. Though the lack of castors may be domestically inconvenient, the rack's ability to sit firmly on the carpeted floor may have helped the turntable's performance at low frequencies.

Disc

The JVC L-A21 turntable has a fairly heavyweight plinth though the platter mat is not as good as that fitted to some budget models (notably the Rotel and Pioneer turntables). The deck offers auto-return facility only, there being no pitch control as this is a belt drive deck with synchronous motor. The arm seemed flimsy and was fitted with a JVC Z-1S cartridge which tracks at 1.75 gram. The turntable seemed fairly good on measured tests, falling down on speed drift and by running nearly 1% fast. The cartridge tracked well but did not offer low distortion while the receiver's phono input stage with this cartridge connected seemed more hissy than normal.

The JVC R-1XL receiver is built in Singapore and in terms of finish falls behind what JVC have provided for the budget market in the past. The tuning scale caught the attention immediately being rather fleckily printed. The receiver's styling at first leads to confusion as the large knob to the right of the fascia is the tuning knob and not the volume control which is the far right knob in a bank of five below the tuning scale. The amp section of the receiver offers input facilities for disc sources, a record/replay on tape 1 (DIN duplicated) and a play-only tape 2. Two pairs of speakers can be driven separately or together. The balance control had an even characteristic

while the tone controls were of the traditional Japanese type with cut or boost of 8dB at 100Hz in the bass and 10kHz in the treble. The loudness control to compensate for the ear's reduced sensitivity to high and low frequencies at low levels offers both treble and bass boost.

The JVC turntable with its fitted cartridge was played through the R-X1L receiver into the reference speakers with the orchestral test track. The sound was fairly flat but the treble suffered from a high frequency 'squeak' in brass. The sound quality was good in comparison to other similarly priced systems except for this top end problem. The turntable did run noticeably fast however and listeners could become aware in quiet passages of motor drone from the deck being transmitted through the system. The rock excerpt had a wiry, almost edgy, sound in guitar with cymbals sounding dry and not a little sand-papery. On the plus side, backing vocals were well resolved out in the stereo image and in general stereo separation and imaging were both good. Bass was lightweight but neat with no overhang.

The crossed-pair-miked chamber music recording lacked a bloom in the woodwinds but the high frequency problem could make them edgy and loud. Heavily modulated sections of this disc were poorly tracked while again the motor drone was audible in quiet passages. Stereo imagery was firm both in depth, which was a little enhanced by the frequency balance, and laterally across the sound stage. The turntable exhibited good footfall isolation.

Receiver

The tuner section of the receiver turned in very good measurements for such an inexpensive model, lacking only a flat frequency response trace. Most important of the test results was that for distortion, as this showed that the distortion was quite low right across the tune window – which means that in practice the user will have no difficulty in consistently achieving a low-distortion signal. The frequency response trace was no catastrophy in that the problems were at the frequency extremes and were both gentle roll-offs, evenly lopping-off high frequencies and low.

On broadcast speech in comparison to the reference tuner the JVC R-X1L lacked only the former's 'airiness' and sounded very close to the reference despite its measured response. In a piano concerto, where the frequency extremes were more important than in voice, the top and bottom roll-off could be heard in the lack of orchestral bass weight and lack of sparkle in the piano. Imagery was neat and the sound had a very wide dynamic range sounding in this respect very fine. Some hiss intruded in quiet passages though it seems likely that this was from the amplifier stages of the receiver as the effect was also noticed on the disc input. Medium wave reception was not too good, with blurred diction in spoken word and a boxy, 'small' sound on orchestral music.

Cassette

The JVC KD-A11 cassette deck is a true budget design having no extras and being equipped with mechanical piano-key transport controls and simple moving coil (needle) meters with no peak LEDs. The cassette hatch is to the right of the machine, the only controls being the three position tape selector, Dolby noise reduction switch and the ganged left and right record level control. The piano-key transport controls were rather stiff to operate while the flywheel in the transport itself seemed very noisy and could be heard during quiet moments in classical music. Head access for cleaning was not easy considering the hatch door could not be removed (or only with care, experience and a screwdriver). Despite its basic facilities and lack of finesse, the cassette deck measured very well indeed on the test bench – though its performance in pseudo-chrome tape was not as good with respect to frequency response as that on ferric formulations in the ferric or 'normal' tape position.

As listening tests on each system had been carried out using the best tape for the chrome position TDK SA tape was used for auditioning despite the less than flat response with the JVC. The sound was heavy and thickening with no bloom or 'air' when playing back the orchestral test piece previously recorded from the reference turntable. Rock music was thickened, 'fat' and boomy with forward vocals and a lack of clean punch. Ferric tape showed a much better treble sound cleaning up on the chrome tape sound to a great degree.

Pre-recorded tape replay was tried using the ferric-equalisation orchestral test tape. The fast running of the KD-A11 was noticed immediately as too was a general sense of hiss and hum (partly due to the amplifier section the receiver). The orchestral sound, though, was very good with a slightly 'racy' treble quality and strong stereo imagery. The chrome-equalisation rock tape had a good sound close to the reference cassette deck's performance but with a slightly forward balance and a 'fluffiness' in the bass lines of electric bass guitar. The cassette deck was certainly far flatter in response on replay only of pre-recorded tapes than it was in the chrome position for record/replay.

Summary

No speakers were supplied with the JVC GR100 system and though a budget receiver, the R-X1L

was not short of power – it delivered a good 32 watts on test, every bit as powerful as the amps in slightly more expensive systems. No problems should be encountered with speakers of average efficiency in even fairly large domestic rooms.

The disc system was fair in every respect and came fitted with a cartridge that could be used for a good while with satisfaction though in the longer term improvements could be made by the purchase of a higher-performance cartridge. The receiver was auditioned in the reference system to check out the amplifier section on familiar material and this proved less tight in the bass than the reference amplifier, and a touch boomy and loose.

The frequency extremes being lacking in the tuner seemed not to impair its excellent sound quality. The cassette deck, it seems from our sample, works best with ferric tape types when it can give good sound in the context of this system. The pre-recorded cassette replay showed a fine flat response spoiled only by the unaccepably fast running which degenerated to nearly 2% overspeed by the end of a cassette as the load came off the feed spool.

The equipment was felt to be well finished, the receiver tuning scale apart, and the sound quality which could be achieved through the reference speakers with this system as it stands is certainly deserving of a Best Buy status.

JVC GR100

DISC (performance via amplifier)

Frequency response	20Hz – 15kHz	good
Stereo separation	– 38dB	excellent
Distortion	2%	poor
Hum and rumble	– 66dB	good
Hiss	– 72dB	below average
Speed variations	0.13%	below average
Speed accuracy	0.9%	poor
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	50Hz – 9kHz	below average
Stereo separation	– 35dB	very good
Distortion	0.27%	above average
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	500uV	very good
Selectivity between stations	82dB	excellent
Sensitivity, mono	1.6uV	excellent
Sensitivity, stereo	22uV	good

Signal strength meter levels (1) 3.2uV (2) 8uV (3) 20uV (4) 40uV (5) 160uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	Scotch Metafine	

Frequency response, record/replay:

Ferric tape setting	21Hz – 14kHz	above average
Chrome tape setting	21Hz – 10kHz	below average
Metal tape setting	21Hz – 14kHz	above average

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 12.5kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 42dB	very good
Distortion	1%	good

Noise, Dolby in:

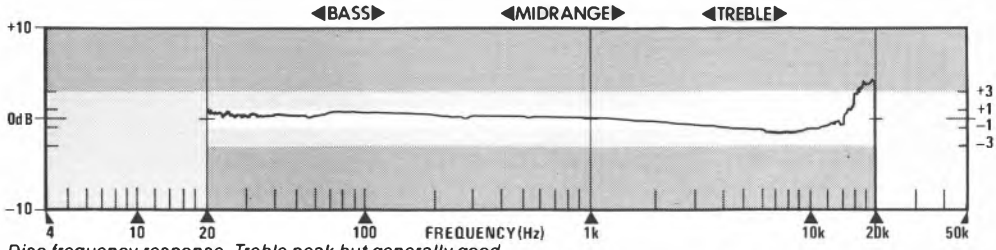
Ferric tape setting	– 56dB	below average
Chrome tape setting	– 59dB	typical
Metal tape setting	– 60dB	typical
Speed variations	0.07%	very good
Speed accuracy	1.3% fast	very poor

AMPLIFIER

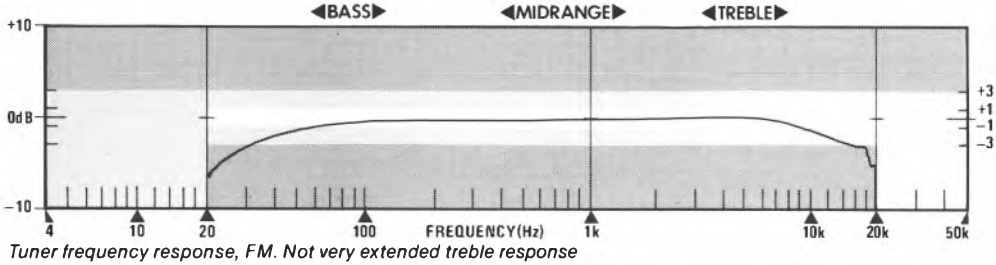
Power output, per channel	32 watts	medium power

GENERAL

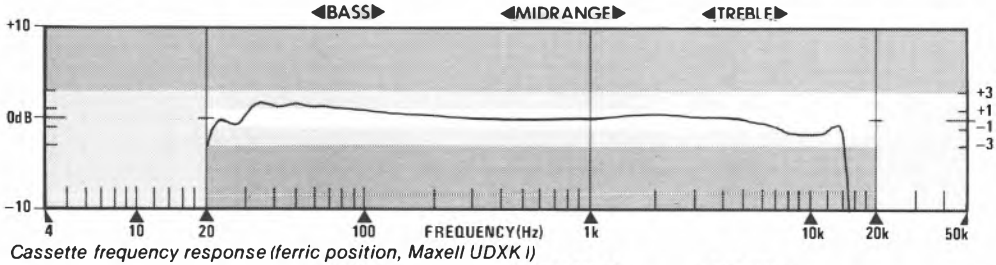
Rackdimensions	82cm x 48cm x 39cm
Price	without speakers, £289



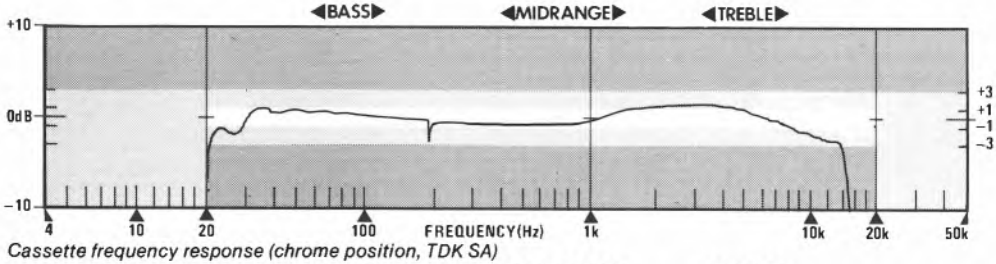
Disc frequency response. Treble peak but generally good



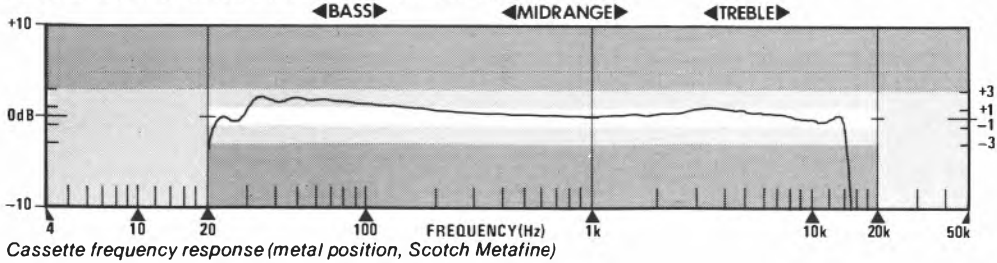
Tuner frequency response, FM. Not very extended treble response



Cassette frequency response (ferric position, Maxell UDXK I)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, Scotch Metafine)

RECOMMENDED

JVC GX200

JVC (UK) Ltd, 6-8 Priestley Way, Eldonwall Trading Estate, Staples Corner, London NW2 7AF
Tel 01-450 2621

JVC's middle-market GX-200 II system does not compete on the grounds of gimmicks or remote control but by offering what claim to be above-average electronics – the choice of cartridge and speakers is up to the buyer.

The LK-G242B audio rack supplied with the GX-200 system is well packed and comes with fair instructions. Assembly is straightforward as the parts are numbered and the hinges and catches are assembled and in place. The rack proved to be fairly stable when built up but the castors didn't help on deep pile carpet. Finish is in black vinyl with chrome beading and strip on the side edges and plinth which make the completed rack quite stylish.

Disc

The JVC L-F41 turntable is a direct drive model with full arm automation and pitch control. The plinth was solidly built though only a thin mat covered the platter and the plastic headshell on the arm was rather flexible. No cartridge is fitted to the L-F41's arm for the UK market and we used an Ortofon FF15EII, as we did with the other turntables supplied to us without cartridges. Measured performance of the turntable motor unit was excellent while the cartridge measured well bar its treble response which was down from about 2kHz until it rose at 18kHz to peak at 20kHz. The response is a slightly exaggerated version of the curve quite commonly encountered with the FF15E.

JVC's A-X2 amplifier is a slightly more powerful version of the A-X1 design but incorporates a five-band equaliser instead of the conventional treble and bass tone controls on the A-X1. This equaliser has five sliders offering a centre detent and up to 12dB cut or boost at 40Hz, 250Hz, 1kHz, 5kHz and 15kHz and while disagreeing with JVC about the equaliser's usefulness in combating room problems (the bands are too few and too wide) I am pleased to see the record-out facility on the equaliser which allows the home recordist to equalise the signal going to the tape 'record' output but to monitor the signal flat from source. It seems ironic that

JVC have now forgotten – at least there's no mention in current literature – that 'SEA' originally stood for Sound Effect Amplifier. It seems to have gained in respectability! One final criticism is that a 12dB cut or boost is far too severe and leaves no control over the first 2dB when useful subtle changes can be made.

The JVC turntable with our Ortofon FF15E and the A-X2 were auditioned with the orchestral test disc on the reference speakers. The sound had a wide dynamic range and though the midband was forward and the image overdeep because of the dipped response the sound was good – I would describe it as 'easy-going' without intending to imply criticism. Rock music had a neat lively sound with a shade of splash in cymbals and a rather full bass. Importantly, you could hear the way the lead singer used the microphone and how the sound changed as he sang and moved relative to it. The crossed-pair-miked chamber piece showed good imagery though the depth was enhanced by the presence band dip. Flute was 'whistly' in the top end. Tracking was good.

Tuner

The JVC T-X2L is a fully synthesised digital tuner with both manual tuning and automatic scanning up and down the wavebands – though in practice it was found that the auto scan was too tempted to stop at weak stations. Manual tuning is by a small edge wheel which was very hard to operate and made accurate tuning difficult. A memory button and seven presets are used to store one FM and one AM station on each preset. The 'ready' indicator shows when the tuned station can be entered into a preset. The signal-strength meter fitted to the T-X2L was more than just a row of lights which come on for the smallest signal – their sensitivity has been well chosen. The tuner measured well in all respects except for its falling response above 8kHz in the treble.

On broadcast speech, in comparison with the reference tuner, the T-X2L tuner sounded a little rich, lacking the 'air' and sparkle of the reference. In male voice too there was a slight clacky colouration in the formants of words. With choral music the T-X2L lacked the bass presence of the reference tuner, and this, coupled with the falling top end and the lack of 'air' in the voices and acoustic, didn't allow the JVC to sound as convincing as the reference – it is fair to say that the JVC lacked the sense of 'being there' on this large scale choral work. Overall however the sound was judged to be reasonably flat below the treble problems. The tuner did have a commendably quiet background, free from hiss and hum.

Cassette

The KD-D35 cassette deck is unusual in having the cassette compartment to the right of the machine with the transport controls arrayed vertically on the far right of the fascia and the inputs and tape selection switches to left of the almost centrally placed record level controls. Moving the transport controls from underneath the cassette hatch has allowed room to open the door widely allowing excellent access to the heads – and making a slimmer deck as well! The left and right record level controls are ganged and used in conjunction with the excellent wide-dynamic-range peak meters, which read down to −20dB and up to +9dB allowing the user to get every last benefit out of the improved treble headroom on metal tapes.

The KD-D35 is fitted with two noise reduction systems. The first is JVC's ANRS (Automatic Noise Reduction System) which is now compatible with Dolby and can be used successfully to decode pre-recorded Dolby encoded tapes.

Like the familiar Dolby B system, ANRS works by boosting low-level treble frequencies before they are recorded – so that even quiet parts of the music are recorded at levels well above the inherent noise produced by the tape. This 'encoding' process is mirrored by a 'decoding' process on replay – the treble frequencies are brought down again to their proper levels, and in the process the hiss from the tape is automatically reduced.

Super ANRS is JVC's further development of similar principles. While this does not claim to offer a greater suppression of tape hiss, it does extend the effective headroom of the tape – there is more room for peaks. So a recording made with Super ANRS should allow bigger peaks without distortion, and should therefore be 'cleaner' and more dynamic-sounding. But Super ANRS-encoded tapes will not play back correctly on a machine without the Super ANRS facility, which is unique to JVC.

Scotch Master I and Maxell MX tapes were tried on noise measurement with Dolby and Super ANRS and showed no difference. Incidentally the machine we tested gave a very poor response with the recommended ferric tape (Maxell UDXL I) – Scotch Master I gave far better results.

The final noteworthy feature of the KD-D35 deck is the music scan facility which offers tape scanning to search out the end of one and beginning of the next track on a tape – it can also be used for auto rewind and playback. The usual limitations of this type of system applies – to operate, it needs three seconds or longer pauses between items on the tapes and a quiet background with limited dynamic range music.

Using TDK SA tape the orchestral test piece

was recorded and replayed against the original source using the reference loudspeakers. The taped sound from the JVC deck had an impressively flat response with some slight graininess and a little upper bass colouration but this was judged excellent sound quality in every important respect. The rock test piece was next taped and compared, when bass seemed less tight than the source with a trace of boominess but again the sound was close to that of the disc.

Pre-recorded tape replay was tried next, first with the orchestral ferric tape. There was some loss of orchestral bass weight in comparison with the reference cassette deck. There was also the sense of a slight presence band hump in the response which tended to push woodwind instruments out toward the front of the orchestral stereo image. This was a very good sound indeed. On the pre-recorded rock tape with chrome EQ, the electric bass guitar lacked some weight in the upper bass while the low bass seemed a shade boomy. There was a slight emphasis to the vocal line again suggesting a lift in the presence band on the replay response.

Summary

There were no speakers supplied with this system and so for the sake of thoroughness a wider range of test pieces was tried on the JVC disc system and amp with the reference speakers. The sound was always good but the upper midband dip which gave rise to a lack of impact in some programmes and the 18kHz peak in the extreme treble, heard as an edge to string tone and piano, was due to the low capacitive loading of the cartridge and other cartridge designs would give a flatter response in this system.

The amplifier was auditioned in the reference system when it seemed that some of the low bass problems mentioned with cassette deck were in fact attributable to the amplifier.

Though the speaker-exclusive price of this system is undoubtedly high, so to is the build quality of the equipment and the sound quality it can produce. The tuner and cassette deck in particular offered flat wideband sound free from distortion. A recommendation is clearly in order, a Best Buy being missed because of the highish price.

JVC GR200 II

DISC (performance via amplifier)

Frequency response	20Hz – 4kHz	poor
Stereo separation	– 23dB	above average
Distortion	1.5%	below average
Hum and rumble	– 67dB	very good
Hiss	– 75dB	above average
Speed variations	0.06%	very good
Speed accuracy	0.1% fast	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 11kHz	average
Stereo separation	– 43dB	excellent
Distortion	0.2%	good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	600uV	good
Selectivity between stations	75dB	very good
Sensitivity, mono	2uV	good
Sensitivity, stereo	26uV	above average

Signal strength meter levels (1) 6.3uV (2) 25uv (3) 50uV (4) 200uV (5) 500uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I
Chrome tape setting	TDK SA
Metal tape setting	Maxell MX

Frequency response, record/replay:

Ferric tape setting	28Hz – 5kHz	very poor
Chrome tape setting	28Hz – 11kHz	average
Metal tape setting	28Hz – 17kHz	very good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 12.5kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 45dB	excellent
Distortion	0.8%	good

Noise, Dolby in:

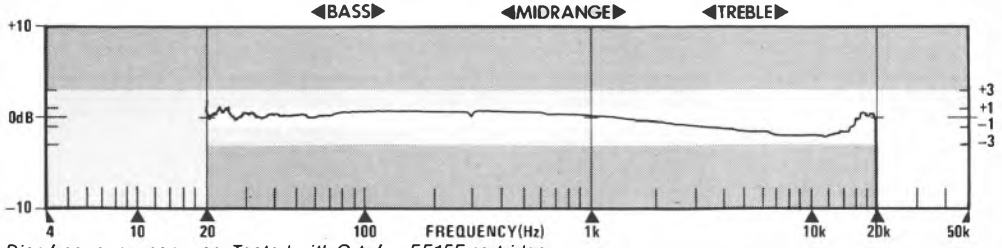
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 61dB	good
Metal tape setting	– 58dB	typical
Speed variations	0.1%	above average
Speed accuracy	0.7% fast	below average

AMPLIFIER

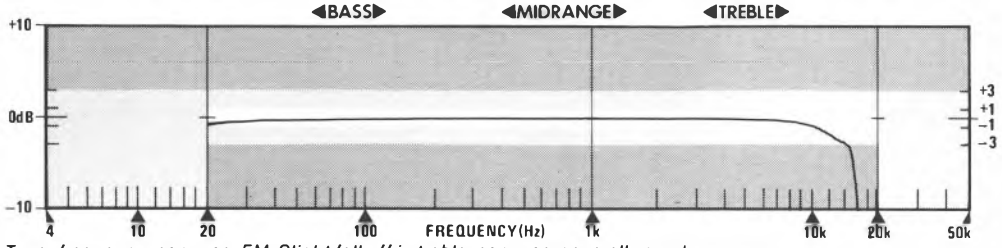
Power output, per channel	45 watts	medium power

GENERAL

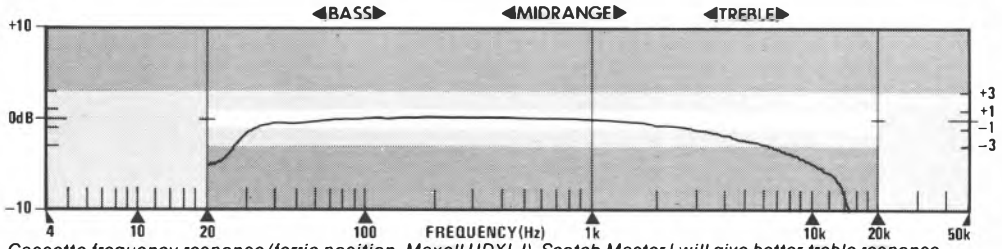
Rack dimensions	89cm x 48cm x 39cm
Price	without speakers, £589



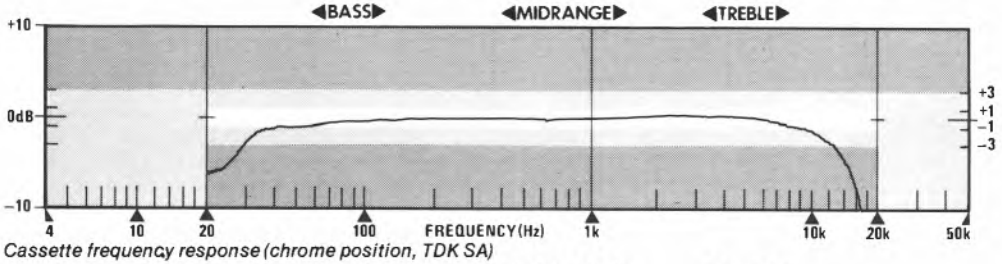
Disc frequency response. Tested with Ortofon FF15E cartridge



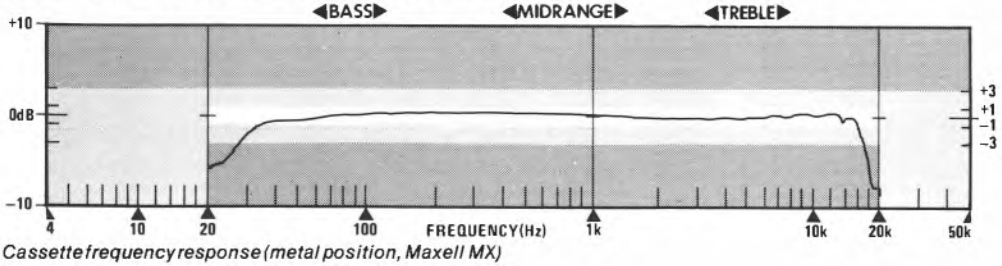
Tuner frequency response, FM. Slight fall-off in treble response, generally good



Cassette frequency response (ferric position, Maxell UDXL I). Scotch Master I will give better treble response



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, Maxell MX)

Marantz 310

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

Some years ago Marantz used to advertise their equipment as being 'Rolls-Royce' audio – in those terms the Marantz Module 310 is the 'mini Metro' of the current range. Our review sample was supplied with the conventionally styled Module 310 VR 100 rack. This comes in packing which is not re-useable, but with a good parts check list and the thoughtful, if somehow worrying, inclusion of a re-order form for any broken or missing parts.

Assembly was slow working from the blue-print quality instruction leaflet and there was no preassembly of door hinges. The magnetic catch proved hard to place and the record supports were hard to fit. The finished rack is solid with a fixed shelf and no castors, but the dark brown vinyl and gold trim could start to look a bit tatty.

Disc

The Marantz TT-1200 is a belt drive model offering automatic arm return only. Apart from the Pioneer PL120, the Marantz models are the only rack-system turntables we tested having any form of suspended subchassis to give resistance to external vibration. The mat on both this and the more expensive TT-2200 could do with replacing to get the best out of the motor unit (the Osawa or Avon mats are the least expensive of the specialist mats).

The arm and cartridge combination measured rather badly with the arm showing resonance problems on the response frequency trace. The fitted Excel cartridge was a very poor tracker even at 3 grams downforce. This low level of performance will probably produce record damage. The turntable package seems badly thought through, being a combination of a weak, resonant arm tube with a stiff cartridge. The result is very poor tracking and – despite the suspended subchassis – a susceptibility to feedback howling.

The Marantz PM310 amplifier is a compact, basic design with connections for one tape deck and one pair of speakers only in addition to disc, tuner and auxiliary inputs. The subsonic filter and tone controls offer the traditional shallow

roll off and 10dB cut or boost – the tone controls themselves are the sliders instead of rotary knobs with centre detent and click stops every 2dB. The lower LEDs in the V-shaped power meter array are redundant by being so sensitive that they are lit almost all the time.

Playing the Marantz record deck and amplifier through the reference speakers on the orchestral test piece showed a heavily coloured resonant bass with a very dull top end in strings and woodwinds. Tracking was always on the edge of breakup with gross distortion in the climaxes of the wide dynamic range disc. Rock music was suited well by the mid-prominent sound, while bass was 'fat' and 'murky', cymbals leaden and the stereo image crude. The crossed pair chamber recording had a very dull balance with no sense of 'air' while the sound was stable but the image amorphous.

Tuner

The Marantz ST-310L tuner is a basic three band design with a wide tuning scale having a centre tune indicator built into the end of the tuning pointer. This indicator made tuning easy, though the signal strength meter was too sensitive. On test, the tuner measured well for a budget model with exceptional selectivity and high sensitivity. The only point worth noting here is that the tuner needs quite a healthy aerial signal to achieve minimum noise.

On broadcast speech, in comparison with the reference tuner, the Marantz confirmed its flat measured response though the sound was a touch boomy or chesty in male voice with some sibilance, while female voice was a little heavy. The stereo image of a solo piano was not quite as confidently placed as the reference and the mid tones were rather full. For a budget tuner this was considered an excellent performance.

Cassette

The Marantz SD-1030 cassette deck is a simple budget design with soft-touch mechanical controls that seemed slow to latch. Access to the heads for cleaning was only fair. Eleven-segment LED meters reading from −20dB to +6dB were considered good while tape selection was made by a rotary switch beneath the tape counter and record/pause indicator LEDs. The deck measured well in every respect except distortion, which showed bad head saturation at low frequencies. The OVU level on this machine was set higher than usual, which helped give a better figure for signal-to-noise but with the trade-off of increased distortion – hence the exceptionally high distortion figure quoted.

Using TDK SA tape, part of the orchestral test disc was recorded for replay against the source. The Marantz had a somewhat 'tubby' string tone and lack of treble extension which lead to a 'airless' quality to strings. The orchestral bass was lightweight with the lower strings' rhythmic underpinning being more difficult to follow. Bass was muffled. On the rock excerpt the sound was fairly well detailed and forward in vocal lines. Bass energy was low and drums sounded fluffy and lacked both weight and clean impact. Cymbals were dead-sounding.

On pre-recorded test material the SD-1030 sounded rather hissy with no real treble extension in strings – the triangle sounded distorted when rung in comparison with the reference deck. On the rock chrome tape the sound was a shade muffled with diction in the lyrics being difficult to catch. The deck lacked the open feel of the reference and the clarity gained from a smooth extended treble and bass.

Speakers

The Marantz SP-235 speakers are neatly finished in brown vinyl with foam grilles covering the characteristic Marantz blue baffle. The SP-235s contain two drive units, a 70mm paper tweeter and a 180mm paper mid/bass unit, the only crossover component being a series capacitor to protect the tweeter from large low frequency signals. The carcass is produced in 1cm-thick material with a layer of fibre inside.

The in-room plot shows well the lack of any real integration between the drivers with the steep-sloped 'hole' centred on the presence band at 2kHz. The bass and midrange seemed smooth enough but the tweeter's treble energy was far too strong at about 5kHz in the treble. On the reference system, playing the orchestral test piece, the Marantz speakers showed a very 'humpy' bottom-end and lower-mid quality with a 'squeaky', nasal sound to strings. The sound image was very central with little lateral stereo separation. Rock music had a very boomy bass from electric guitar which suggests that the 125Hz peak shown in the in-room plot may not be all due to a room resonance mode, the ⅓-octaves on either side being up in level too. The string quartet showed a very strong nasal colouration in string tone with grainy treble and problems from surface noise. The distinctive timbre of the wind quintet instruments in the crossed-pair recordings were confused and blurred together. There was little sense of a recorded acoustic in this simply-miked material.

With the Marantz turntable and amplifier the speakers were auditioned again on the orchestral test piece – the sound was limited with a dull treble quality showing a papery colouration in strings. Bass grumbled and boomed while flutes lacked 'air' and 'bloom'. The rock track was mistracked badly by the fitted Excel cartridge – the sound was confused and hard to

interpret with flat, dead-sounding cymbal crashes and no real low-frequency extension below the upper bass boom. Piano too lost its body presence in a boomy upper bass wash, sounding very 'fat' and coloured. There was little sparkle in high chords which also lacked the necessary percussive sound. The cartridge mistracked badly on piano transients.

Summary

The electronics of this system were badly let down by the transducers, that is the cartridge and loudspeakers. The turntable worked well enough as a motor unit but the arm and cartridge combination was a very bad match causing problems all round with high frequency mistracking and low frequency feedback. There is a relatively inexpensive cure in the shape of a replacement stylus assembly, details of which are given in the Summary section to the Marantz Module 350 review.

The tuner performed exceptionally well for a budget model. The amplifier too proved lively and exciting to listen to if a little uncontrolled in the treble, and so both items can be recommended in isolation. The SD-1030 cassette deck was overall a good performer but suffered from low frequency distortion which spoiled pre-recorded tape replay. The SP-235 speakers are heavily coloured though really no worse than the average rack speaker.

As a £350 rack combination this equipment cannot really be recommended but with the fitting of a better cartridge the system can improve markedly on disc replay. Marantz will also supply the system without speakers at £299 which, again noting the turntable limitations, would be worth recommending.

MARANTZ 310

DISC (performance via amplifier)

Frequency response	200Hz – 2kHz	very poor
Stereo separation	– 26dB	above average
Distortion	3%	very poor
Hum and rumble	– 66dB	good
Hiss	– 78dB	excellent
Speed variations	0.1%	above average
Speed accuracy	0.5% fast	below average
Tracking ability	12cms/sec	poor

TUNER (performance via amplifier)

Frequency response	50Hz – 17kHz	very good
Stereo separation	– 41dB	very good
Distortion	0.5%	average
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	1.5mV	poor
Selectivity between stations	80dB	excellent
Sensitivity, mono	1.6uV	excellent
Sensitivity, stereo	20uV	very good

Signal strength meter levels (1) 2.5uV (2) 5uV (3) 10uV (4) 40uV (5) 125uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	TDK D
Chrome tape setting	TDK SA
Metal tape setting	TDK MA

Frequency response, record/replay:

Ferric tape setting	22Hz – 9kHz	below average
Chrome tape setting	22Hz – 13kHz	above average
Metal tape setting	22Hz – 15kHz	good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	100Hz – 12kHz	good
Chrome tape setting	100Hz – 12kHz	good
Stereo separation	– 42dB	very good
Distortion	5.8%	very poor

Noise, Dolby in:

Ferric tape setting	– 58dB	good
Chrome tape setting	– 60dB	typical
Metal tape setting	– 60dB	typical
Speed variations	0.06%	very good
Speed accuracy	0%	excellent

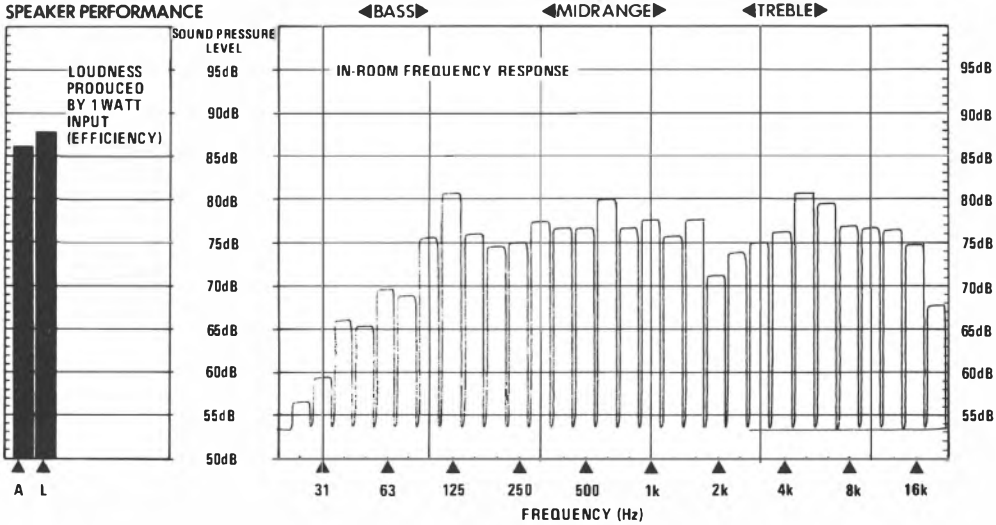
AMPLIFIER

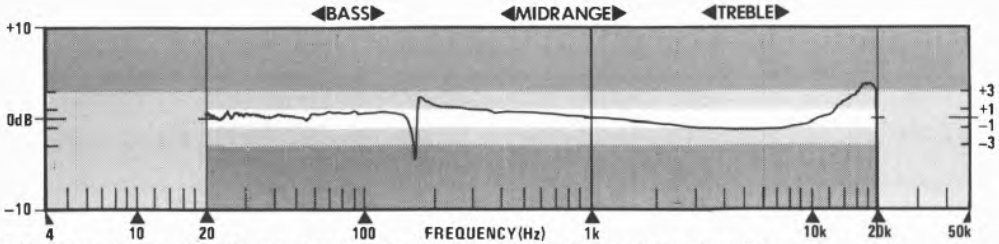
Power output, per channel	28 watts	low power
Potential maximum volume with speakers supplied	103.5dB SPL	

GENERAL

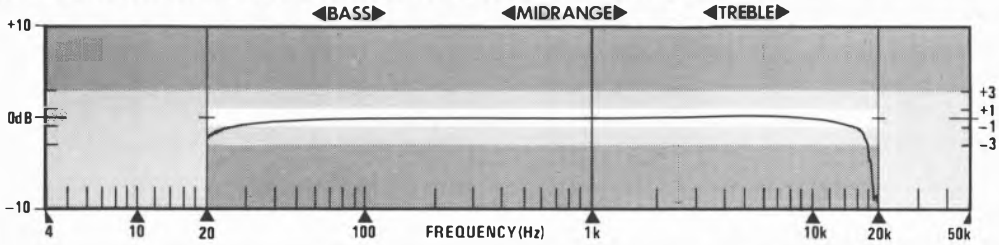
Rack dimensions	86cm x 46cm x 40cm
Speaker dimensions	49cm x 29cm x 22cm
Price	including speakers, £350

SPEAKER PERFORMANCE

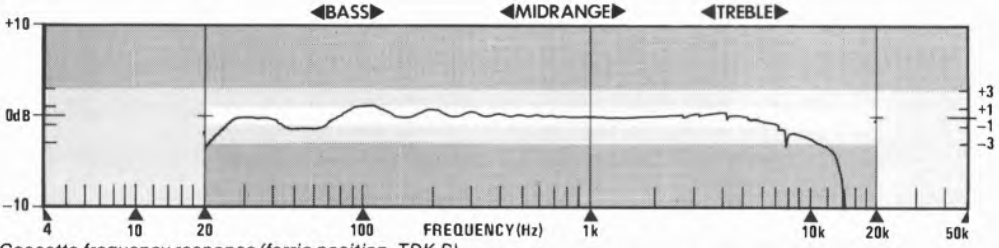




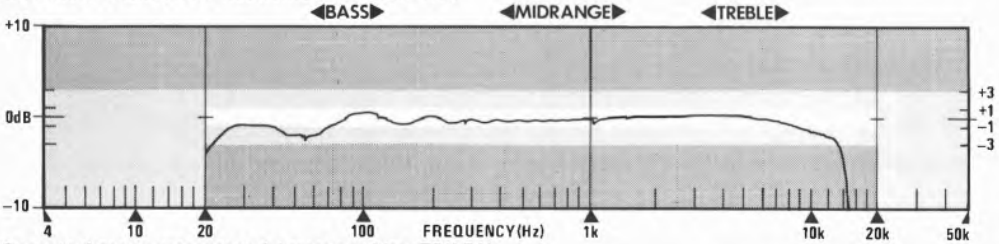
Disc frequency response. Ragged bass response and poor treble from cartridge supplied



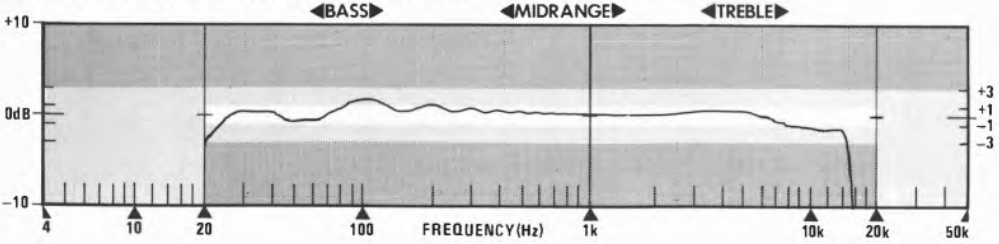
Tuner frequency response, FM. Fairly good performance



Cassette frequency response (ferric position, TDK D)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA-R) Note similar low-frequency characteristics on each tape

RECOMMENDED

Marantz 350

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

A more powerful and generally better-specified alternative to the 310 system, the Marantz Module 350 comes with the same choice of alternative racks. The most unusual of these, which we chose for review purposes, is the VR-250.

This rack is reminiscent of studio equipment trolleys and comes packed in a bulky box with the simplest of instructions as the parts are few. Assembly is quick and easy and the finished rack very strong but fitted with castors which, though essential to the design, don't help the turntable resist footfall feedback too well. The finish is good and it is nice to have a properly finished full-width drawer as part of a rack.

Disc

The Marantz TT-2200 turntable is a direct-drive-motor version of the TT-1200 reviewed as part of the Module 310. Because of the servo controlled motor, pitch control is possible and two edge-wheels are provided, for fine adjustment of each speed. The turntable has a suspended subchassis in addition to its compliant feet which is not normally seen on a deck at this price and must help the TT-2200 to obtain good figures for low frequency noise. The motor unit performed close to speed with little drift.

The arm fitted to the TT-2200 is the same as that on the TT-1200 and so is the Excel ES70S cartridge and it is this combination that pulls down the performance of the disc section of the Module 350. The cartridge not only mistracks heavily but has high measured distortion and a pronounced high frequency peak at 20kHz. The deep notch seen in the frequency response trace at 180Hz is due to severe arm resonance.

A neat, slimline model, the Marantz PM-350 amplifier offering connections for two pairs of speakers driven independently or together. Though only one tape recorder can be connected for record/replay, the auxiliary socket can be used to dub from a second machine on to tape 1. The tone control stages of the Marantz are divided three ways into treble, bass and a midrange control offering 10dB cut or boost on a

slider with centre detent and further click stops every 2dB. Power meters are provided as strings of LEDs in a V-shaped arrangement.

Auditioning the Marantz TT-2200 and PM-350 through the reference speakers showed up the cartridge's top-end response immediately on the orchestral test disc. Woodwind and brass instruments were unpleasantly edgy and sounded as though the cartridge were at the edge of mistracking all the time. The rock track had a forward but cloudy vocal line, while the electric bass guitar dominated the sound. Cymbals were very peaky. The crossed-pair-miked chamber excerpt had a blurred and smeary image while the flute lacked overtones and was smeared together with the oboe by the system's soupy midband character – mistracking was bad.

Tuner

The Marantz ST-450L tuner is immediately recognisable as being a Marantz tuner by the 'trade mark' of edge-wheel tuning, called 'Gyro-Touch' by the manufacturers. The ST-450L is not a fully synthesised model but has a digital readout of the received frequency instead of a tuning scale and pointer. A centre-tune indicator and fair sensitivity signal-strength meter make tuning easy with the very free flywheel effect of the tuning wheel. On the test bench the tuner offered consistently well above average results.

Comparing the Marantz with the reference tuner on broadcast speech showed it to sound very close to the reference on male voice, but having a slight thickness lower down and a 'dryness' in the treble. Grand opera showed the same dryness or slight brightness in female voice and while the ST-450L was found to lack the openness of the reference tuner and to sound a little edgy in large scale choral pieces, it was close. Medium wave reception was a bit 'honky' and nasal in speech but was good.

Cassette

The SD-1030 cassette deck supplied with the Module 310 system was auditioned as part of this review, as the model is included in both systems, though effectively this only checked out the difference between the Marantz 310 and 350 amplifiers. In fact it was found that the PM-350 amp sounded less brash when driven hard and more confident in the bass with, odd to report, a slightly less open midband quality than the less expensive 310.

It does seem strange that Marantz include the SD-1030 cassette deck in the Module 350 system as this is definitely a budget model, though looking at their current range, it appears you would need to go to the Dolby-C equipped 3030 model which is some £75 more than the 1030 to gain a substantial improvement in sound quality. The intermediate 2030 model does not have the LED metering offered by the 1030.

Speakers

The Marantz HD-445 speakers supplied with the Module 350 are three-way models finished in wood-effect vinyl with blue baffles and are made in Belgium. The cabinets are produced from good quality chipboard without damping, though the internal air space is damped with two rolls of acoustic fibre. The fairly well-rated crossover integrates the 25mm soft dome tweeter to the 120mm paper midrange unit at 8kHz which itself crosses over to the 200mm corrugated-paper bass unit at 2kHz. The crossover points are visible on the in-room plot though this also shows a neatly rolled-off bass (the 125Hz peak seems to be a room mode) and a fairly even response between 150Hz and 8kHz.

On the reference system it was immediately apparent that these speakers had hi-fi pretensions and were something much better than the average rack system speaker. The orchestral test piece showed a forward-balanced stereo image with some peakiness in the string treble. Low-frequency control was good. The rock track showed up the 'squeaky' high frequency peak in cymbals and in female voice a presence lift around 4kHz. There was some 'honky' colouration in the lower midband, though on the plus side the speakers didn't sound tiring when played loud. The string quartet recording showed up the hollow midband suckout between 1kHz and 2kHz rather badly though the low register of viola and cello were well handled – violin tone had an 'edge' at times.

On the crossed-pair-miked chamber music excerpt there was a fair sense of this being a recording of instruments placed at distinct points within a reverberant acoustic. The oboe was a bit 'whining' and 'nasal' but overall the sound was good apart from the curious quality to the presence band which seem to be caused by crossover problems.

With the Marantz turntable and amplifier the HD 445s sounded 'splatty' in the top end of the orchestral test piece. Midrange was forward and sibilant, brass instruments were very brash while string tones could sound 'whistly'. The Excel cartridge's mistracking was certainly not disguised by the speaker's treble peak. Rock music showed the treble peak in cymbal crashes, while vocals were sibilant although the backing voices seemed detailed. Solo piano sounded on the edge of breakup all the time, as a result of the limited tracking performance of the cartridge. The bass line played by the left hand was 'fat' with little incision which was disappointing considering the speakers' previous good low frequency performance and must be

due to turntable problems. The dynamic quality of the music was intact but the 'loud' balance and general colouration levels from the system spoiled the end result.

Summary

Most obvious weakness of the Module 350 system lies in the arm and cartridge though the solution, or at least a part solution, is ony £11 away – and these comments apply equally to the TT 1200 in the 310 system. The Excel cartridge body is a common mass-produced generator from Japan and is also used as a basis for the specialised cartridge products of Elite Electronics. The Elite range of styli can therefore quite legitimately be introduced into the Excel ES70S body. We auditioned the TT-2200 with an Elite 450 elliptical stylus (the £11 worth) when tracking was much improved as was image depth and detail, while coloration levels were reduced and a flatter response achieved.

The only other question mark hangs over the 1030 cassette deck, as in this system context it does seem overshadowed by the performance of the other equipment. The tuner, amplifier and speakers all performed well but it is the inclusion of a pair of speakers which make a strong positive contribution and do not merely fatigue the listener, which ensures recommendation.

MARANTZ 350

DISC (performance via amplifier)

Frequency response	200Hz – 13kHz	above average
Stereo separation	– 29dB	good
Distortion	3.3%	very poor
Hum and rumble	– 66dB	good
Hiss	– 76dB	good
Speed variations	0.07%	very good
Speed accuracy	0.2% slow	very good
Tracking ability	12cms/sec	poor

TUNER (performance via amplifier)

Frequency response	25Hz – 16kHz	good
Stereo separation	– 39dB	very good
Distortion	0.2%	good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	630uV	very good
Selectivity between stations	74dB	very good
Sensitivity, mono	2uV	good
Sensitivity, stereo	25uV	above average

Signal strength meter levels (1) 1.3uV (2) 5uV (3) 20uV (4) 40uV (5) 200uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

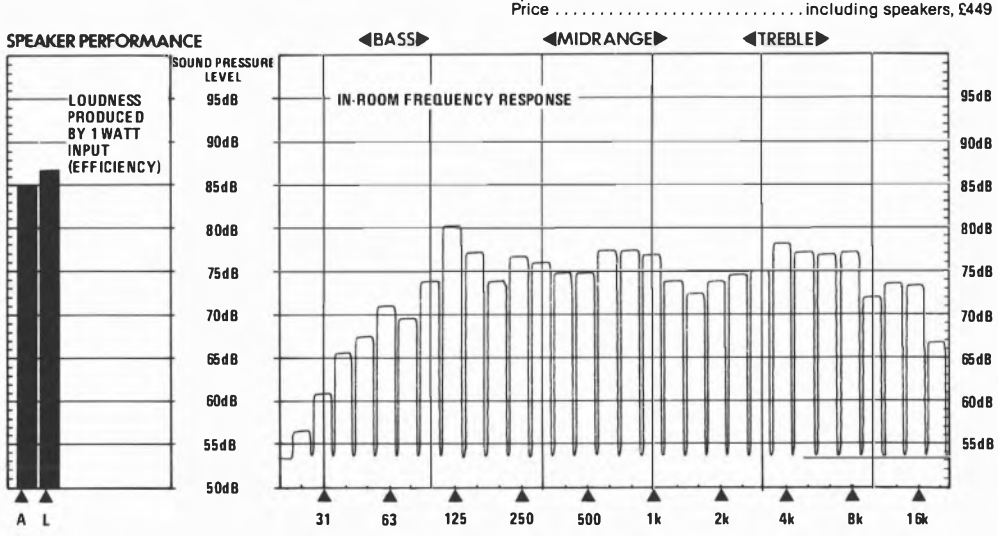
Ferric or Normal tape setting	TDK D	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	22Hz – 9kHz	below average
Chrome tape setting	22Hz – 13kHz	above average
Metal tape setting	22Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	100Hz – 12kHz	good
Chrome tape setting	100Hz – 12kHz	good
Stereo separation	– 42dB	very good
Distortion	5.8%	very poor
Noise, Dolby in:		
Ferric tape setting	– 58dB	good
Chrome tape setting	– 60dB	typical
Metal tape setting	– 60dB	typical
Speed variations	0.06%	very good
Speed accuracy	0%	excellent

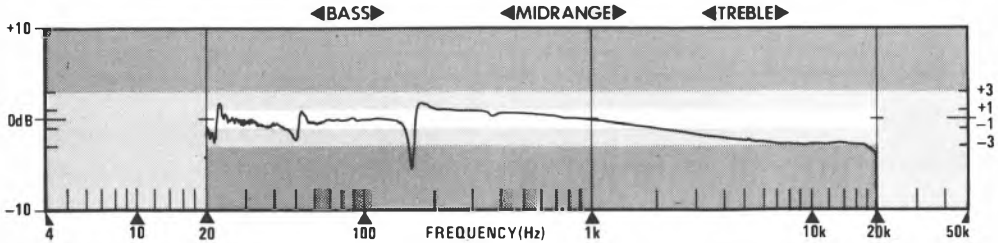
AMPLIFIER

Power output, per channel	50 watts	medium power
Potential maximum volume with speakers supplied	105dB SPL	

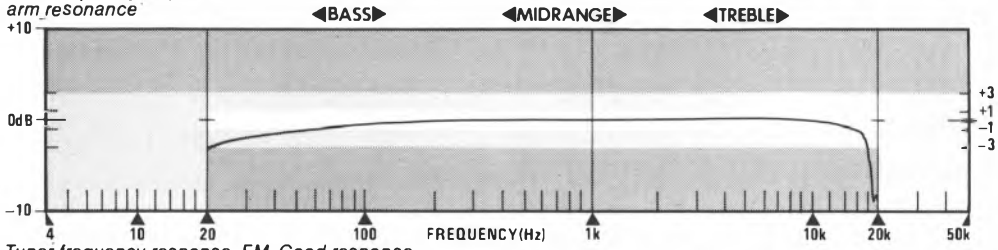
GENERAL

Rack dimensions	73cm x 48cm x 40cm
Speaker dimensions	49cm x 29cm x 22cm
Price	including speakers, £449

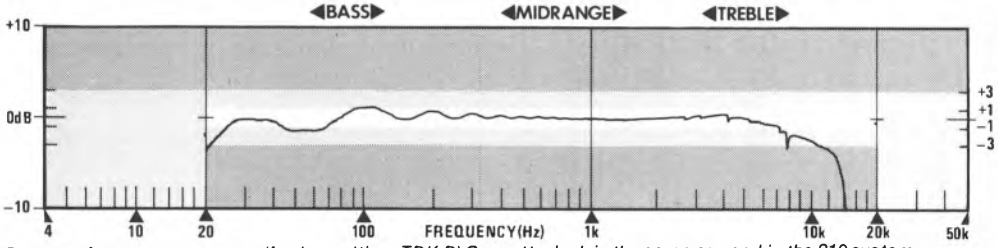




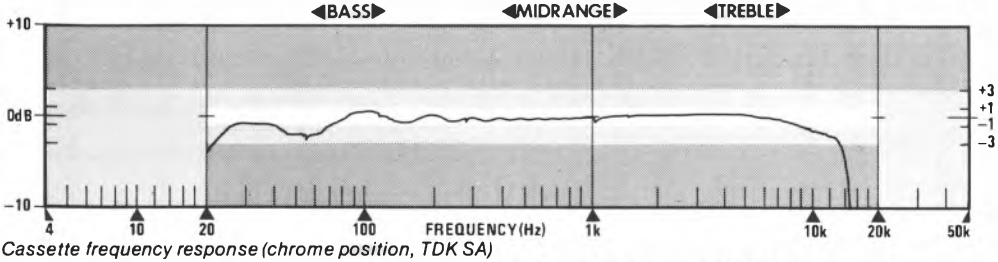
Disc frequency response. Result bears similarity to 310 system except for treble peak – 'kink' is due to severe arm resonance



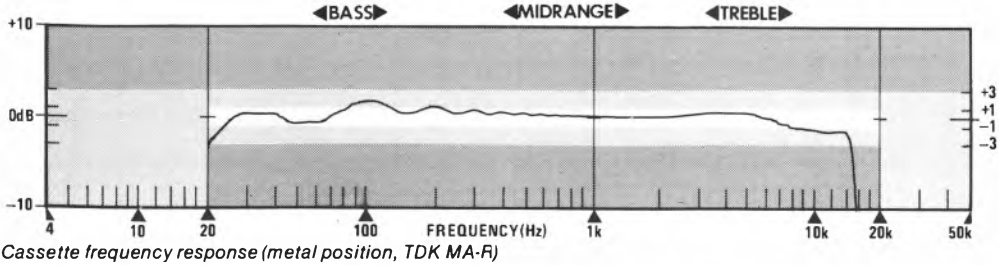
Tuner frequency response, FM. Good response



Cassette frequency response (ferric position, TDK D) Cassette deck is the same as used in the 310 system



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA-R)

Mitsubishi System 3

Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD
Tel Watford 40568

Though one of Japan's biggest electrical manufacturers, Mitsubishi are relative newcomers to the UK hi-fi scene. The System 3 is the current top of the range model. The UK-made HFR-1 rack was fairly well packed and the instructions gave good diagrams for assembly. The rack proved relatively easy to build as the joints were pre-assembled though the door hinges needed putting together. The rack is quite distinctively styled with double glass doors and glass front panels to the sides, one of which was missing from the packing, but the execution of the glasswork left something to be desired.

Disc

The DP-780 turntable has a substantial plinth and proved to be well isolated from feedback problems. The arm and platter mat were less satisfactory – the headshell was thin and flexed in particular rather too easily. The fitted cartridge, however, turned in a good measured performance with secure tracking, low distortion and fair stereo separation. The problem again was the frequency response of the cartridge which was commendably flat to around 5kHz in the treble but rose to peak at 18kHz.

The DA-U640 amplifier is a neatly designed unit offering above-average power, 66 watts, for this price range. In addition to full tape dubbing between two tape decks (one also) the amp can drive two pairs of speakers independently or together and will accept inputs from tuner, disc and auxiliary source. The tone controls are of the traditional Japanese amplifier design offering a cut or boost of 8dB in the bass at 100Hz and 10dB in the treble at 10kHz. The subsonic filter not only operates too low down at 15Hz but has too gentle a slope – the same can be said of the high filter which comes in a 7kHz and attenuates the high treble at only 6dB per octave, which makes this filter only suitable for very bad tape noise or broadcast noise on weak FM stations. The loudness control offers a bass and treble lift.

Mitsubishi's turntable and amp were auditioned through the reference speakers with the orchestral test disc, and produced a good stable

sound stage with good stereo imagery – but a dreadfully peaky and edgy treble quality. Rock music showed an unpleasant brightness in cymbals, percussion, guitar and vocals, which spoiled the very fair midband performance. Bass from electric bass guitar was smooth. The crossed-pair wind quintet recording showed good image depth and possessed a sound stage that had well defined images of the individual instruments. But the woodwinds sounded unacceptably bright and hard, while surface noise from the disc was emphasised.

Tuner

The Mitsubishi DA-F640E tuner measured well on the test bench but produced a frequency response trace that was tilted up towards the treble right across the audio spectrum. The tuner is styled to match the amp and has a clear main tuning scale. To the left of this is a preset tuning scale, which doubles as a signal-strength meter for use with the manual tuning knob. The seven preset selectors are in the centre of the fascia but the tuning capacitors and waveband switches to set them are on the right hand side of the tuner and can only be switched and adjusted with the supplied double-ended tool. The presets therefore have to be set before the tuner is installed in the rack. Manual tuning was slow if the whole tuning scale had to be traversed, as the flywheel behind the tuning knob was stiff. Most signal strength meters we have come across have been far too sensitive – Mitsubishi's was, for once, not nearly sensitive enough.

On broadcast male voice, the tuner sounded whistly and sibilant in comparison with the reference tuner. On some baroque music the Mitsubishi tuner sounded 'forward' with a steely colouration in strings and a lack of the 'airiness' that characterised the reference tuner on this particular broadcast. Medium wave reception sufered from noise and sounded muffled.

Cassette

The Mitsubishi DT-640 cassette deck measured better than average on test, but its frequency response too seemed affected in the mid by the amplifier's response. The cassette deck has a centre panel to match the tuner and amp – it is a true soft-touch machine with the potential for optional remote control operation. There are no superfluous gimmicks while metering is done by a combination of moving coil meters (needles) and five peak LEDs, reading from −10dB to +6dB. The cassette compartment was lit from inside and head access was good.

Using BASF Superchrom II tape, the orchestral test piece was recorded and replayed against the source through the reference speakers. The Mitsubishi cassette deck showed a 'treble-forward' balance, as reflected in the frequency response trace. Apart from this 'bright' tendency the cassette deck sounded fair, if a little harsh in the replay of heavily modulated brass passages. The rock recording lacked the 'smack' and impact of the original but was lively if bright in cymbals and female voice.

Replay of the pre-recorded ferric test tape showed a bright thin quality lacking body and orchestral weight. The chrome rock tape was trebly too, lacking impact in the plucked bass.

Speakers

Two of the popular Son-Audax drive units are used in the Mitsubishi SS-640 speakers – a 25mm soft dome tweeter with its own metal mesh grille, and a 180mm doped-paper mid/bass unit with a foam surround. The 14mm chipboard cabinets are undamped and contain a tiny roll of acoustic fibre. There is a six-element crossover network which, while fairly rated is not substantial.

The SS-640s were auditioned on the end of the reference system where on the orchestral test piece they exhibited a 'scrawny' treble and lacked presence. Bass was quite fair but the stereo imaging was vague. The rock track showed a hollow sound with a suckout in the presence band, which lead to the speakers lacking impact, though bass was quite dry and punchy. Apart from a peakiness in cymbals the rock excerpt sounded fair on these speakers. The string quartet recording produced a fair sense of the size of the acoustic space in which the players had been recorded, though the hollow, coloured string tone was not in any way accurate. The crossed-pair-miked chamber recording showed the speakers to be capable of fair stereo imagery with the right material. The sound lacked finesse perhaps but was better than that of many other speakers auditioned on this piece. The depth of the stereo image of the wind-quintet, however, was affected by the frequency balance and the treble 'spike' was not kind during the quieter passages, emphasising disc surface noise.

The speakers were then tried with the Mitsubishi turntable and amplifier, where they exhibited a very unpleasant top-end quality, due to the combined effect of the cartridge's massive treble peak and the speakers' healthy output at 8kHz. The sound of the Mitsubishi disc-playing system on the older orchestral test piece made us wonder if this combination had ever been auditioned by the importers, as the 'fizzy', dessicated treble quality rapidly produced fatigue and spoiled both the midband and imaging qualities. The rock track showed the Mitsubishi system to be of the classic

'showroom attention grabber' type with a very lively treble balance producing sibilant vocals and 'splatty' cymbals. The solo piano suffered from 'milkbottle' treble colouration, which ruined the speakers' otherwise notable ability to recreate the presence of the instrument with the percussive nature of the piano apparent even in the low frequencies. The treble spike and upper bass prominence, with a presence 'hole', are shown well in the in-room plot for the SS-640s.

Summary

The Mitsubishi System 3's potential was never fully realised because of what seemed like simple frequency response errors, first in the disc system with its ferocious treble peak, then in the tuner with its gentle tipped-up response again favouring the treble frequencies. The cassette deck's performance too seemed unduly affected by an upper midband rise.

The Mitsubishi speakers are a disappointment, the more so in that they already exhibit the potential of the driver in the bass and midband but they are spoiled by poor treble performance. The disc system and speakers in combination were most fatiguing to audition. Mitsubishi have the potential here to build a middle-market winner, but the current standard of performance does not merit recommendation.

MITSUBISHI 3

DISC (performance via amplifier)

Frequency response	20Hz – 7kHz	average
Stereo separation	– 24dB	above average
Distortion	0.7%	good
Hum and rumble	– 66dB	good
Hiss	– 73dB	below average
Speed variations	0.06%	very good
Speed accuracy	0.1% fast	excellent
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 4kHz	very poor
Stereo separation	– 40dB	very good
Distortion	0.4%	above average
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	1.2mV	below average
Selectivity between stations	80dB	excellent
Sensitivity, mono	4.5uV	poor
Sensitivity, stereo	28uV	average

Signal strength meter levels (1) 12uV (2) 50uV (3) 125uV (4) 250uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting .. TDK OD

Chrome tape setting .. BASF Super Chromdioxid II

Metal tape setting .. TDK MA

Frequency response, record/replay:

Ferric tape setting	42Hz – 15kHz	good
Chrome tape setting	26Hz – 15kHz	good
Metal tape setting	42Hz – 14kHz	above average

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 12.5kHz	above average
Chrome tape setting	40Hz – 2kHz	treble peak
Stereo separation	– 52dB	excellent
Distortion	1.5%	average

Noise, Dolby in:

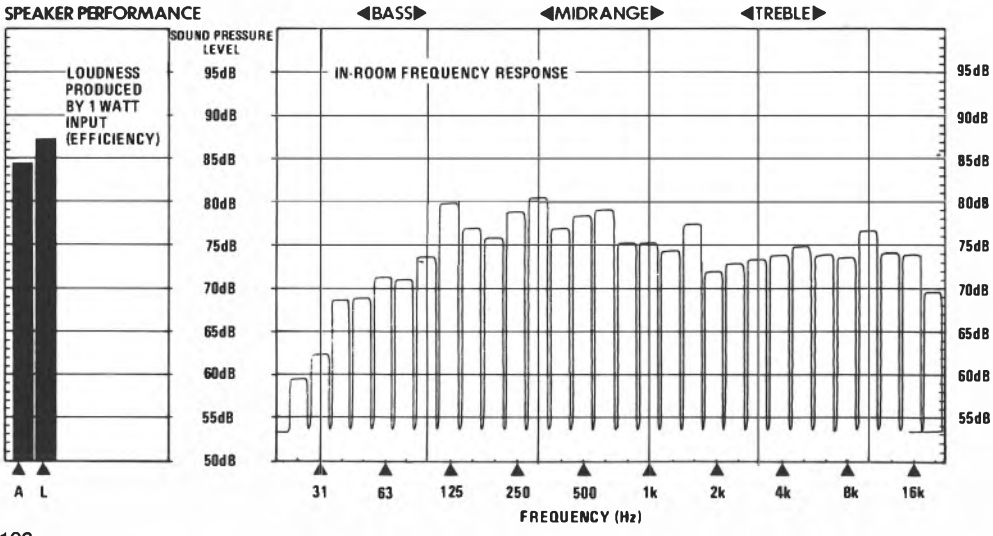
Ferric tape setting	– 56dB	below average
Chrome tape setting	– 58dB	typical
Metal tape setting	– 56dB	poor
Speed variations	0.05%	excellent
Speed accuracy	1% fast	very poor

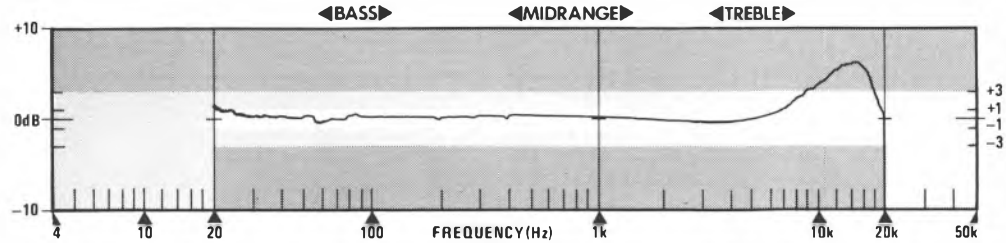
AMPLIFIER

Poweroutput, perchannel	66 watts	high power
Potential maximum volume with speakers supplied	106dB SPL	

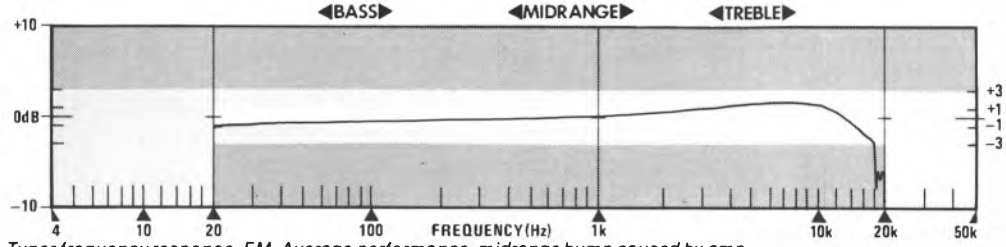
GENERAL

Rack dimensions	94cm x 50cm x 43cm
Speaker dimensions	47cm x 27cm x 24cm
Price	including speakers, £492

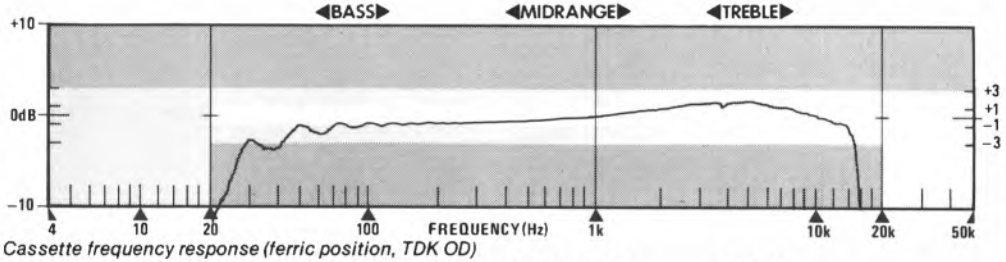




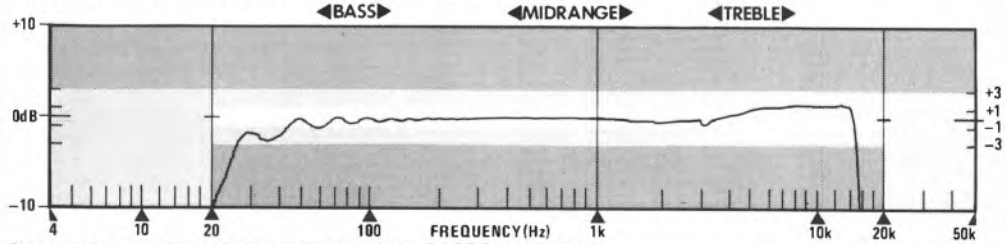
Disc frequency response – severe treble peak spoils performance



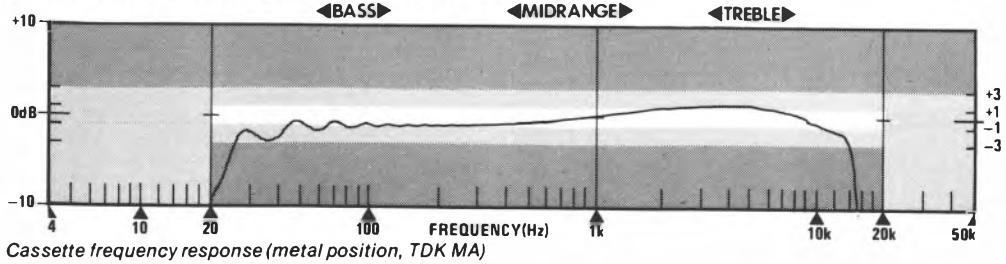
Tuner frequency response, FM. Average performance, midrange hump caused by amp



Cassette frequency response (ferric position, TDK OD)



Cassette frequency response (chrome position, BASF Superchrom II)



Cassette frequency response (metal position, TDK MA)

Optonica 4100

Optonica Sales, Sharp Electronics (UK) Ltd, 107 Hulme Hall Lane, Manchester M10 8HL
Tel 061-205 7321

Optonica is the hi-fi brand name of the Sharp Corporation – their hi-fi products have always stressed technological innovation.

The Sharp SY-21X rack which houses the Optonica 4100 system equipment comes well packed though the instruction leaflet is confusingly arranged in five languages! Assembly was easy, with some design though obviously having gone into door hanging as this was far less of a chore than with any other system. The finished rack was substantial with a glass lid and full length glass door though the styling seemed an odd mix.

Disc

The RP-4100E record deck seems an odd throwback considering the Optonica reputation for innovation. Though the motor section has a fair plinth, which resists feedback well, the arm is primitive indeed in having no bias compensation. Luckily the fitted Audio-Technica cartridge proved to be some compensation as despite this omission it tracked well and gave both good stereo separation and low distortion for a budget model. Though the RP-4100E motor unit had good short-term speed accuracy, the measured drift was not so good.

The review sample SM-4100E amplifier had a faulty on/off switch which would not unlatch though it can hardly be expected that this minor problem is widespread among SM-4100s. The amplifier offers simultaneous or individual use of two pairs of loudspeakers and while only one tape record/playback facility is provided, the auxiliary socket can be used to dub from a second tape deck on to tape 1.

The balance control had an even characteristic and the tone controls are of the conventional Japanese amplifier design offering 10dB cut or boost at 100Hz in the bass and 10KHz in the treble. The subsonic filter had rather a shallow slope to be really effective at removing rumble or warp noise without interfering with the signal. The loudness control gives both bass and treble lift.

Frequency response shown by the Audio-

Technica cartridge fitted to this deck was typical of many of the rack system turntables tested, with an upper bass/midrange hump followed by a dip through the presence band and a high-frequency peak, though the effect here was more even and the slopes gentler than many.

On the orchestral test disc through the reference speakers the recessed treble gave an added depth to the stereo image, though the strings sounded 'peaky'. The cartridge tracked well but did 'spit' a bit in heavily modulated brass passages. The sound was good if edgy.

Rock music too sounded peaky on maracas and cymbal crashes. Vocals were sibilant, with the electric bass and drum line being reasonably tight. The crossed pair chamber recording benefitted from the disc system's hum/hiss-free performance, and the well-isolated turntable produced good placement and coherence of stereo images. Flute overtones were rather whistly and the image depth enhanced by the presence droop. Careful auditioning of pure tones from the flute showed up the turntable's slight wow or drift problem. The only other problem with the Optonica disc equipment was that the tuner produced breakthrough of broadcast signals into the signal coming off disc.

Tuner

Optonica's ST-5200H tuner is referred to by them as an 'electronic tuning processor' which is rather pretentious, considering this is a digitally synthesised tuner much like anyone else's! Auto and manual scanning up and down the bands is offered and there is a row of ten presets which can be apportioned as the user wishes between the three wavebands – a flexibility not often encountered. Four HP7 batteries prevent the tuner losing its 'memorised' station settings.

A 'hi-blend' switch which reduces the stereo separation of an FM stereo signal in the treble, making noise less audible. An 'air-check' button switches on an oscillator circuit to enable the user to set the record level of the cassette deck correctly before taping a programme off-air. A fair signal strength LED meter is provided.

Though the Optonica tuner's measured performance was above average it turned in a very poor frequency response trace which showed up as brightness on broadcast speech. Tape hiss from recorded programmes was intrusive because of this treble peak in the tuner – solo piano music sounded much brighter than the reference and had an imprecise, forward stereo image. Medium wave reception was noise free but slightly thickened and lacking the sparkle of the reference.

Cassette

The Optonica RT-5200H cassette deck has true touch-sensitive controls of the microprocessor logic-control, solenoid-operated variety. The LED record level meters cover a usefully wide dynamic range, while the machine will automatically go into the 'record/pause' mode at the touch of one button. The automatic programme search is limited to finding 3 second gaps in limited dynamic range music and so, as Optonica say, doesn't work with 'lectures, conversations, classical music, solo performances, modern jazz', noisy or low level tapes. The machine is provided with a 'record mute' facility which does enable the home recordist to make up tapes with Automatic Programme Search System-acceptable gaps. The record/play head was easily accessible for cleaning.

Using Maxell UDXL-II tape the orchestral test piece was recorded and replayed from the Optonica against the original source. The tape lacked the sparkle of the source and had a stereo image that was a bit forward and confused. Climaxes too were a shade muddled, bass more noticeably so. Replay of a recording of the rock test piece sounded a trifle dull, with kick drum lacking the precision of the original, though the overall performance was thought to be very fair if lacking a little in frequency extremes.

Pre-recorded tape replay was tried next on the ferric orchestral test tape – the sound was slightly forward and bright losing some sense of the recorded acoustic but the performance was found to be close to the reference. The chrome rock tape too was well reproduced with some lack of tightness in the bass.

Speakers

The Sharp CP-21ES speakers had all the makings of being a cut above the common rack system boxes. They contain two good Son Audax drivers and a good four element crossover. The tall 14mm cabinets have deep fixed grille frames over the drivers with the 25mm dome tweeter set down inside a tunnel formed by the thickness of the frame. The flying leads supplied were of insubstantial cable.

Despite the quality of the crossover the in-room plot shows a deep suckout in the 5kHz crossover region and though bass was evenly rolled off the midband seems far from smooth with an emphasised upper bass and a discontinuity at 1kHz.

The speakers were tried first on the reference system with the orchestral test piece, which they made sound very dated with a strong tape hiss problem and thin acerbic string tone. Stereo imagery, however, seemed fair both front-to-back and laterally though the images were not that well focused. The rock vocals had a sibilant

edge while deep bass from drums was absent. The string quartet had a thin 'squeaky' string tone while the acoustic sounded hollow and echoey. The violin's top notes were edgy and hard, producing a sound which at times was smooth but could turn nasty as the notes rose. The crossed-pair-miked chamber recording was weirdly coloured – no doubt due to that midband discontinuity which worried the bassoon most.

The Optonica record deck, amplifier and speakers were next tried together. They produced a very boxy thin sound on the orchestral disc though the combined responses of the speakers and Optonica disc section seemed to produce a flatter frequency response than the Optonica speakers and reference system. Rock music didn't fare well, however, with a 'whistly' treble and hollow boxy bass quality. Piano too was heavily coloured with a resonant rumble rather than a percussive bass quality and with a midrange treble that veered from being leaden to sounding hard. Pitch too seemed unstable.

Summary

The disc section of the Optonica 4100 system lets the side down heavily as it cannot reasonably be upgraded by fitting a better cartridge due to the arm's lack of bias compensation and the motor had speed stability problems. The amplifier in isolation produced a somewhat loose bass. Though this doesn't explain the treble response problem in the tuner, the amp may be behind the bass problems heard during cassette audition. The microprocessor features of tuner and cassette deck worked well, though the heavily coloured speaker sound and disc limitations prevent recommendation.

OPTONICA 4100

DISC (performance via amplifier)

Frequency response	20Hz – 11kHz	above average
Stereo separation	– 29dB	good
Distortion	1%	above average
Hum and rumble	– 66dB	good
Hiss	– 73dB	below average
Speed variations	0.15%	below average
Speed accuracy	0.2% fast	good
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 4kHz	very poor
Stereo separation	– 43dB	excellent
Distortion	0.3%	above average
Minimum noise	– 71dB	very good
Aerial signal for minimum noise	1mV	average
Selectivity between stations	78dB	excellent
Sensitivity, mono	2uV	good
Sensitivity, stereo	30uV	average

Signal strength meter levels (1) 2uV (2) 10uV (3) 32uV (4) 125uV (5) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

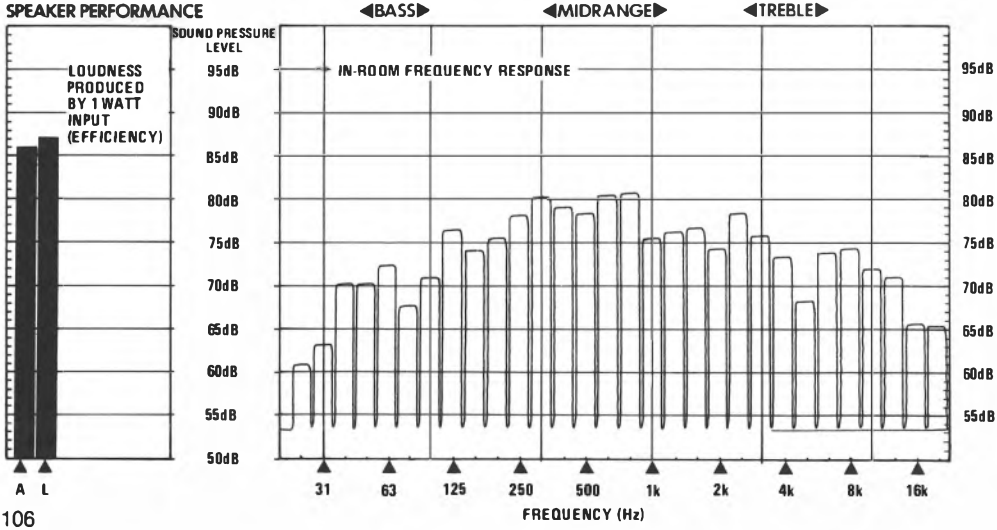
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	Maxell UDXL II	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	32Hz – 13kHz	above average
Chrome tape setting	32Hz – 11kHz	average
Metal tape setting	32Hz – 17kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 12.5kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 52dB	excellent
Distortion	2.3%	below average
Noise, Dolby in:		
Ferric tape setting	– 61dB	good
Chrome tape setting	– 63dB	good
Metal tape setting	– 61dB	good
Speed variations	0.05%	excellent
Speed accuracy	0.2% fast	very good

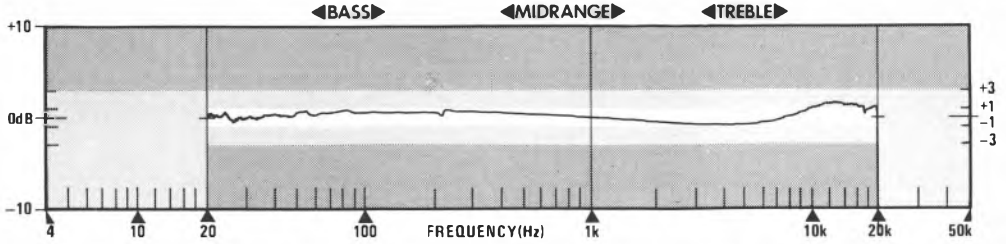
AMPLIFIER

Power output, per channel	50 watts	medium power
Potential maximum volume with speakers supplied	106dB SPL	

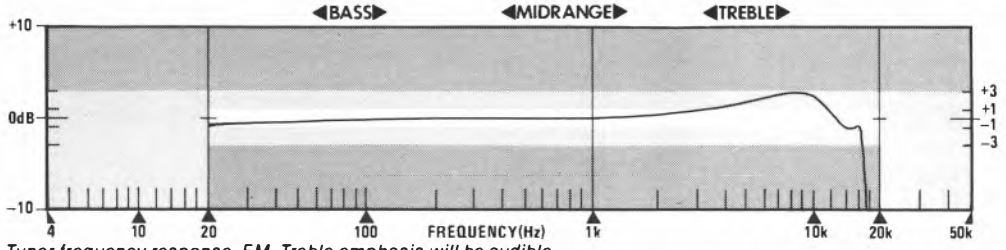
GENERAL

Rack dimensions	95cm x 50cm x 44cm
Speaker dimensions	58cm x 31cm x 23cm
Price	including speakers, £499

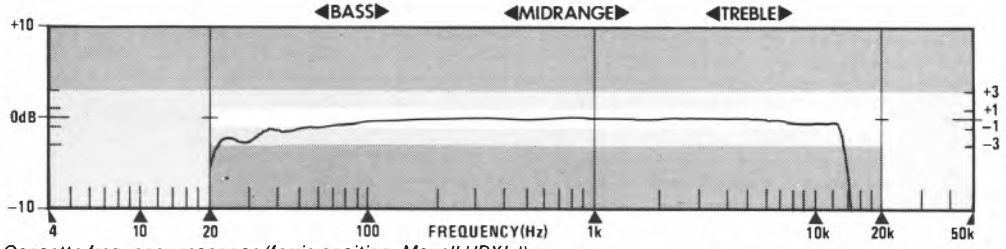




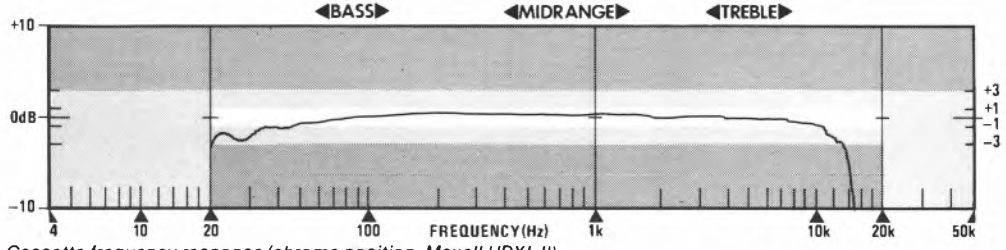
Disc frequency response. Competent result from cartridge supplied



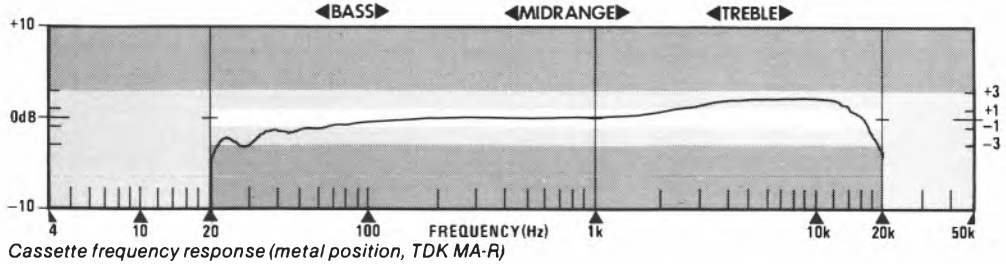
Tuner frequency response, FM. Treble emphasis will be audible



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, Maxell UDXL II)



Cassette frequency response (metal position, TDK MA-R)

Panasonic 2800

National Panasonic (UK) Ltd, 107-109 Whitby Road Trading Estate, Slough, Berks SL1 3DR
Tel Slough 34522

Panasonic is a brand name of the giant Japanese company Matsushita, who also manufacture the Technics brand. This means that in the UK, 'high street' dealers generally sell Panasonic and the specialist dealers sell similar equipment as Technics. The Technics Z11 system, then, has a similar specification to the Panasonic 2800 tested here.

The Panasonic SH-543 rack came well packed with easy to follow instructions, while assembly was simple, there being few parts. Stability of the finished rack was good and the finish neat and 'different', though the vinyl on the UK speakers did not match the Japanese vinyl on the rack.

Disc

Panasonic confusingly describe their SL-H304 turntable as an 'automatic' – semi-automatic would be a better description of this deck as all it offers is end-of-side arm lift. It does not feature auto start. Close inspection reveals that the counterweight on the straight arm fitted to this turntable is virtually fixed, implying that the customer is expected to buy a new turntable when he wants to improve his cartridge! The fitted cartridge could do with almost immediate replacement too considering its poor tracking performance while its frequency response was gently rolled off through the treble to rise again towards 20kHz.

The SU-2800 amplifier is well equipped and capable of handling two tape decks with full dubbing, and two pairs of speakers simultaneously or independently. The LED power meters can be switched to a excessively sensitive setting though in the '× 1' mode they are helpful in establishing general power output levels. The tone controls offer the typical 10dB cut or boost at 40Hz and 20kHz while the loudness control offers a bass boost only of 9dB at 50Hz.

Running the Panasonic turntable and amp into the reference speakers with the orchestral test piece showed the combination capable of stable imagery and fair detail rendition – but in

heavily modulated high frequency passages the system went to pieces with severe mistracking evident. Good image depth was achieved but the frequency response dip in the presence band made this artifically deep. Rock music sounded rather phasey with a smooth treble but a high frequency tizz in cymbals. Mistracking was evident again while the treble quality was wooden and transients oddly distorted – the handclaps sounding more like breaking plywood than handclaps. The cartridge mistracked very badly with the crossed pair chamber recordings, producing an echoey imprecise stereo image.

Tuner
Neat in appearance, the Panasonic ST-2800L tuner has a wide, legible tuning scale though the signal strength meter proved too sensitive to be of real use. On broadcast speech the Panasonic sounded nasally coloured and bright against the reference tuner while on orchestral music it showed good imaging with an extended if slightly dry treble quality tending towards graininess. Bass was a bit rich and confused at times but the overall sound was considered very good. Medium wave reception was noisier than the reference but was of very good quality and a little brighter in balance than the reference.

Cassette
Panasonic's RS-635 cassette deck has 'soft-touch' transport keys of the micro mechanical rather than solenoid operated variety. Though admittedly a budget machine the RS-635 lacked an LED peak indicator, Dolby light and ganged left and right record level controls to be thoroughly equipped. The door to the cassette compartment takes off for good access to the tape head for cleaning. Though the machine is not difficult to operate it should be pointed out that novices will find the multi-lingual heavily diagrammatic instructions very confusing.

TDK SA tape was used to record the orchestral test recording and to replay it against the source. The RS-635 had a droopy upper midband sound which made string tone lack bloom. Bass lacked body and impact too while the image depth was compressed forwards. The rock excerpt had woolly sounding vocals with a smeary bass guitar line while kick drum was blurred and overhung.

On pre-recorded tape, replay hiss became a problem and though the simple quoted figure does not suggest that this is so, a tilted replay response (peaking at 4kHz in the treble) does emphasise hiss unduly. The sound was edgy when loud while the rising response was also responsible for the lost orchestral weight and the brightness in string tone. On the rock chrome tape the bass was very lacking in power but clean all the same. Again the sound was very bright and midband-forward with brittle cymbal sound.

Speakers
Built in the UK for Panasonic, the SB-2800 speakers incorporate a 60mm paper cone tweeter and a 190mm paper mid/bass driver with a pleated surround. These drivers are crossed over through a three-element crossover of fair quality considering what is normal for a rack system speaker. Cabinets are made of 12mm chipboard and are both undamped and unbraced while the enclosed air space is damped with a roll of acoustic fibre. The speaker's back panel was found to be very boomy – the grille frame is made of more substantial chipboard than the cabinets themselves. The speakers are fitted with flying leads of inadequate proportions, entering the cabinets through plastic grommets which threatened to nip the wire or at least allow it to break at that point.

The in-room plot for these speakers shows there to be little integration between the drivers with a suckout in the crossover region around 3kHz in the treble – the tweeter peaks sharply at about 10kHz and falls off rapidly above this frequency, as can be expected from a large diameter paper unit. The speakers were auditioned on the end of the reference system where their 'effy' treble quality emphasised the tape hiss of the older orchestral test disc. The sound was very mid-prominent though important mid tones were both heavily coloured and very thick. Flutes lacked their overtone brilliance while strings sounded thick and papery; plucked double bass boomed. The rock track suffered predominantly in the bass as kick drum sounded very loose, electric bass guitar dominated in a boomy haze in the upper bass region while the overall sound was very undynamic. The string quartet was badly coloured with the cello degenerating into a rosiny buzz and violin tone being whining. The acoustic was both boomy and echoing. The crossed pair chamber recording showed the speakers to be capable of fair imagery though the flute suffered in its overtone structure from the massive treble suckout.

Going back to the 1960's orchestral recording, but this time with the Panasonic turntable and amplifier driving the speakers, showed the Panasonic disc system to produce a laughably hollow dated sound on this piece. The treble was lacking and the cartridge mistracked at every opportunity. Rock music on the Panasonic system had a lively but boomy sound while vocals had a forward hollow shouty character. The sound was resonant and fatiguing. Piano suffered from a woolly midband quality and

though the imagery was quite fair the instrument lacked its necessary percussive quality in the bass and sounded very coloured.

Summary

The limitations imposed by the fixed counterweight on the pickup arm prevent any recommendation for the Panasonic disc system as the fitted cartridge isn't even a fair tracker and required twice the normal bias marginally to clear even the lower levels of our test disc. As the arm cannot be adjusted, any replacement cartridge must weigh 6 gram and track between 1.75 and 2.5 gram, and must also have a deep body like the Panasonic supplied.

The amplifier provided a clean 40 watt output and proved capable of producing quite high levels with the supplied speakers though the coloured sound that these produced was fatiguing. Tuner and cassette deck both proved competent performers though the cassette deck seemed more suited to the production of home-recorded tapes than the replay of commercial cassettes due to its 'bright' replay-only equalisation.

The Panasonic 2800 is not competitive at this price and cannot be recommended.

PANASONIC 2800

DISC (performance via amplifier)

Frequency response	20Hz – 4kHz	poor
Stereo separation	– 27dB	good
Distortion	3%	very poor
Hum and rumble	– 68dB	excellent
Hiss	– 78dB	excellent
Speed variations	0.08%	good
Speed accuracy	0.3% slow	average
Tracking ability	12cms/sec	poor

TUNER (performance via amplifier)

Frequency response	20Hz – 14kHz	above average
Stereo separation	– 42dB	excellent
Distortion	0.15%	excellent
Minimum noise	– 72dB	very good
Aerial signal for minimum noise	1.6mV	below average
Selectivity between stations	78dB	excellent
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	40uV	poor

Signal strength meter levels (1) 2.5uV (2) 10uV (3) 25uV (4) 40uV (5) 63uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	TDK D	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	

Frequency response, record/replay:

Ferric tape setting	50Hz – 14kHz	above average
Chrome tape setting	50Hz – 14kHz	above average
Metal tape setting	50Hz – 14kHz	above average

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	80Hz – 11kHz	average
Chrome tape setting	80Hz – 12kHz	average
Stereo separation	– 53dB	excellent
Distortion	3%	below average

Noise, Dolby in:

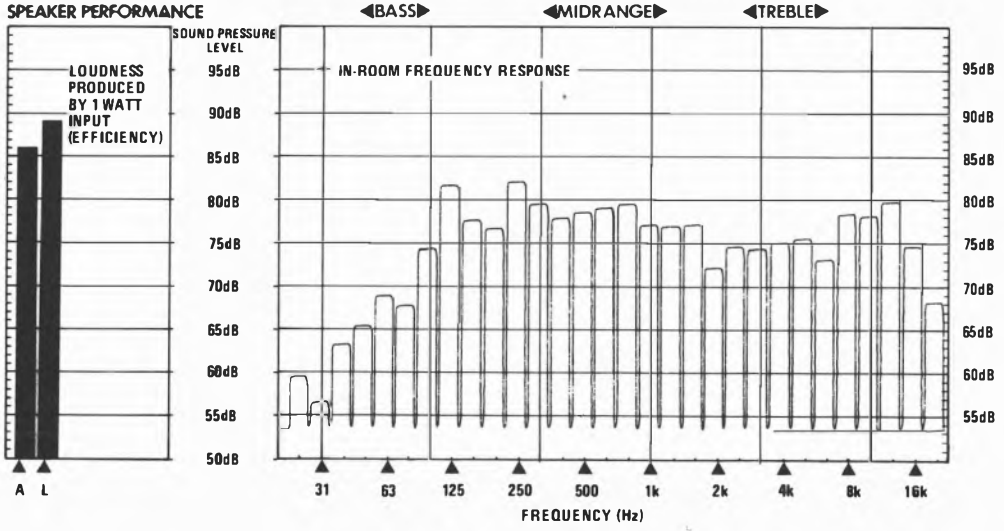
Ferric tape setting	– 56dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 58dB	typical
Speed variations	0.12%	average
Speed accuracy	0%	excellent

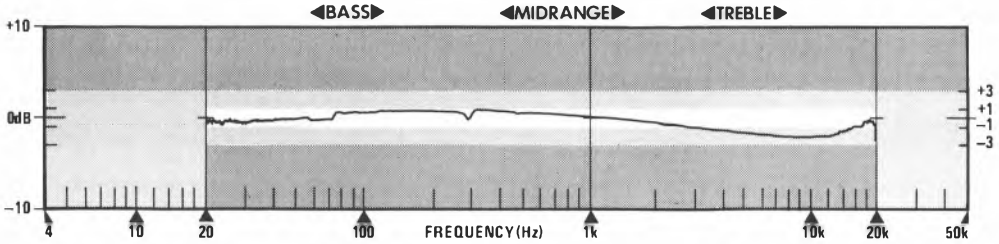
AMPLIFIER

Power output, per channel	40 watts	medium power
Potential maximum volume with speakers supplied	105dB SPL	

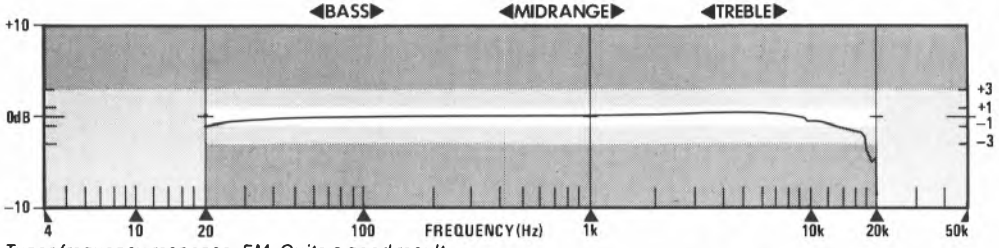
GENERAL

Rack dimensions	81cm x 48cm x 40cm
Speaker dimensions	48cm x 25cm x 18cm
Price	including speakers, £359

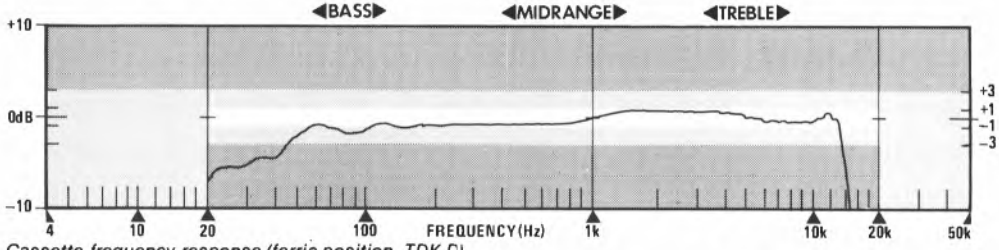




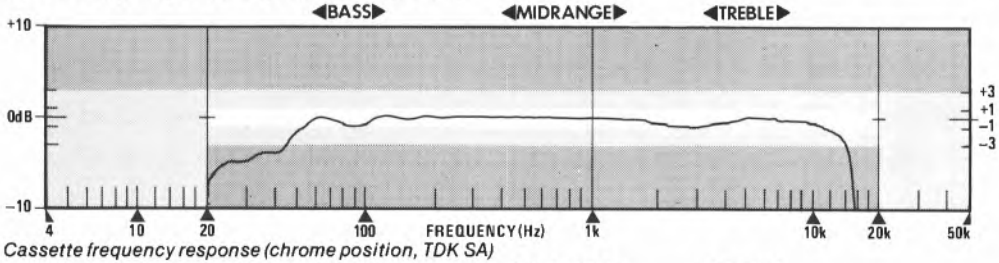
Disc frequency response. Average response characteristic for budget cartridge



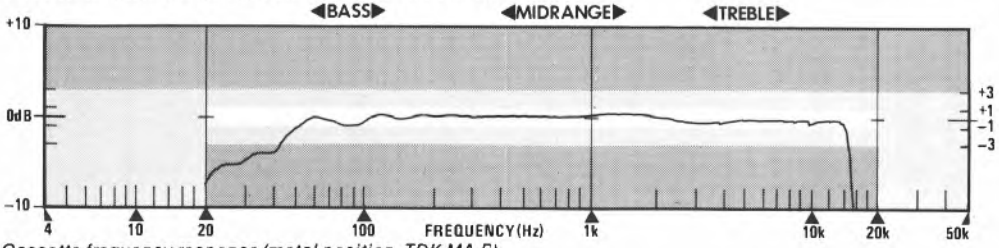
Tuner frequency response, FM. Quite a good result



Cassette frequency response (ferric position, TDK D)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA-R)

Philips 112

Philips Electrical Ltd, City House, 420-430 London Road, Croydon, Surrey CR9 3QR
Tel 01-689 2166

Philips are one of the few remaining European manufacturers who can take on the Japanese in mass production terms. The System 112 equipment is built for the European market in Belgium. The K2 rack, however, is of UK manufacture – it was delivered well packed but with instructions that lacked detail. This rack proved fairly easy to assemble but the glue provided in sachet form seemed to be unnecessary. Once assembled the rack was sturdy with fair vinyl finish and a neat door with clear screen printing.

Disc

The Philips F 7112 turntable is a very lightweight design indeed, the plinth being a thin one piece plastic moulding. The semi-automatic arm is of the straight wand type and comes fitted with a Philips G500 Super M cartridge in an absurdly flimsy headshell. The platter was not well seated on the main bearing as it had a tendency to rock, but no problems caused by this were to be seen in the measurements. The arm rest contains a crudely calibrated but fairly accurate tracking force gauge.

One design fault with this deck was in the perspex lid, which fits over two sprung pillars. When it is lifted to near the vertical, the lid tips back, either taking the lightweight plinth with it or simply dropping off its hinge pillars.

The F 4110 amplifier is a neatly-styled unit with plastic used widely in its construction. The amp, surprisingly for a European design, is fitted throughout with phono sockets rather than DIN and it can accept inputs from one tape deck, a record player, tuner and one auxiliary input. One useful provision is a mono button. The tone controls give extreme cut or boost, 12dB at 40Hz in the bass and 20kHz in the extreme top, and the loudness control offers both bass and treble lifts to compensate for the ear's lost sensitivity at frequency extremes when listening at low levels. Two pairs of speakers can be connected, with switching for both 'A' and 'B' speaker pairs or for speakers 'A' alone. The balance control was noisy in operation crackling in the attenuated

channel as the control was rotated.

Measured response of the G500 Super M cartridge into the F 4110 amplifier showed a marked lower midband hump with a deep suckout in the treble region, topped off by a high frequency peak. The Philips turntable and amplifier were first played through the reference speakers with the orchestral test piece, when fair tracking was obtained. Sound quality, though, was dull in strings with a very hollow resonant colouration. There was a strong emphasis of lower-register string passages while the woodwinds lacked both presence and bloom. Rock had a smooth rolled-off top, though male voice boomed in the chest tones. Electric bass guitar sounded forward in the mix but lacked real low frequency extension. On the crossed pair chamber recording the motor drone from the turntable were clearly audible in quiet passages and the flute tones suggested that the turntable was wowing badly. The sound had a dull balance with little sense of acoustic space.

Tuner

The F 2110 tuner is a primitive device when seen alongside a good Japanese budget model. A wide clear tuning scale, tuning knob, wave band selectors and signal strength meter are the only features. Rather than having its own power supply on board, the tuner takes its power from an outlet on the back of the amp. On the test bench the tuner showed good separation figures and an excellent charted response but suffered from very high distortion while its minimum noise figure was spoiled by its susceptibility to AM breakthrough. Remarkably the output level when receiving FM broadcasts was found to be dependent upon signal strength – the tuner dropping its output by 3dB (subjectively, halving volume) for a drop in aerial signal from 1mV to 50μV. The tuner additionally proved very tune sensitive with weak stations and its automatic frequency control was ineffective with these signals.

During audition it was found that the best sound quality did not necessarily come with a full-scale deflection on the signal strength meter (in fact though the scale markings are '0' to '9', the minimum meter reading obtainable was '3.5' and the maximum, for signals of 500μV and over '7.5'!). The tuner was very fatiguing to listen to on broadcast speech with a nasal edgy 'plasticky' quack to the transients in speech. Orchestral music suffered from a hissy background noise and sounded crude, the top especially being bright and lacking all subtlety of ambience.

Cassette

The Philips F 6112 cassette deck has a most odd soft touch transport control array, set between the meter window and the cassette compartment. The pause button seems to be a second stop control rather than a true pause. The meters had very slow ballistics and really require an additional peak LED, which is not provided. Head access was only fair as the deck couldn't be put into the play mode with the cassette compartment door open. The transport of this machine was noisy and distracting during quiet passages of classical music. On the test bench the F 6112 proved to be a fairly competent performer though it suffered from high distortion.

Using Maxell UDXL IIS the Philips machine sounded slightly more 'forward' than the source on the record/replay test of orchestral material. There was some uneasiness and loss of 'air' in massed brass sections but the sound was generally fine. Rock music vocals were pushed forward and while there was a loss of treble detail and cymbals sounded rattly the sound was considered to be very competent.

On pre-recorded tape replay things were not so good because of the very noticeable slow running. The ferric orchestral tape lost a bit in the frequency extremes but the midband sound was very fair. The rock chrome tape showed bass to be a bit overhung though the rich-midband sound was considered generally good.

Speakers

The Philips F 9216 speakers are two-way designs with fixed grilles. The drivers are described by Philips as being a 2 inch tweeter and a 7 inch woofer crossed over at 3.6kHz. There was no way to check the drivers identity or the quality of construction of the cabinets without smashing the speakers irreparably and so it must be deduced from Philips' description 'capacitive coupled' that the tweeter is protected from low frequency signals by a series capacitor and that no real crossover network is incorporated.

With the orchestral excerpt on the reference system the Philips speakers gave little stereo imagery, and had a very confused hollow sound with boomy bass, veiled mid and a nasty high frequency 'spike'. The in-room plot shows this character quite well. Rock bass was coloured by a bad cabinet drone while the midband was reasonably open and the treble fizzy in cymbal crashes. String tone was nasal and spiky on the quartet recording – this excerpt was not pleasant to listen to at all with a very acid 'peepy' edge to the violins, and no sense of the recorded acoustic. The crossed pair recording of a wind quintet had a very hollow sound with smeary imagery and no sense of acoustic.

With the Philips turntable and amplifier on the orchestral piece there was little stereo separation and lots of lower midrange boom. The sound was veiled but not too fatiguing. Rock

music had a ploppy boomy bass with a wiry twang in guitar and leaden cymbal crashes. Solo piano was very unimpressive, with a dull, boomy and hollow sound lacking dynamics.

Summary

When the amp was auditioned in isolation in a reference system it proved to offer a sound quality that was clean and detailed if a touch dry. The disc playing system is fronted by a noisy turntable with an insubstantial plinth – though the cartridge gave a good performance.

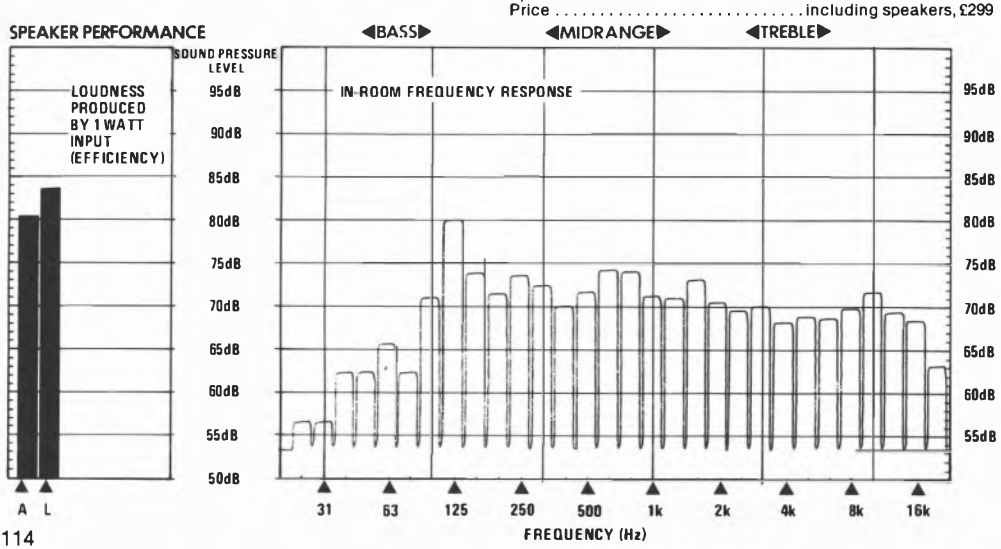
The tuner appeared well below par and a look inside showed that it is a very simple design despite the 'hi-fi' appearance. The tuner circuits are contained on one compact board inside a large plastic moulded framework which occupies most of the space inside the unit. The push buttons on the fascia are actually the ends of long mechanical rods which actuate push buttons mounted on the circuit board itself. All this suggests that this board has another life elsewhere – from the tuner's measured and heard performance I would not be surprised to see this board in a portable stereo radio. This tuner is a very low point for Philips.

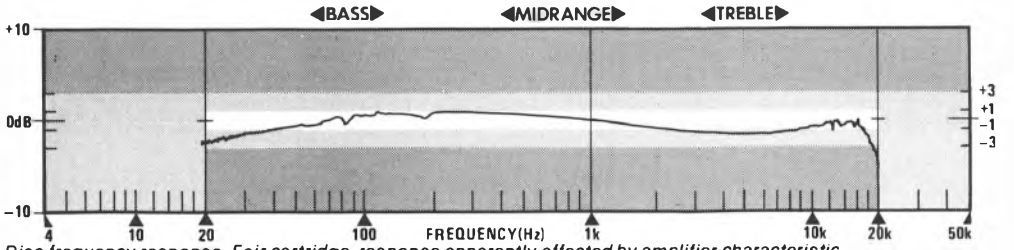
The cassette deck proved good on record/replay tests but was found to be running unacceptably slow for pre-recorded tape replay.

The speakers were heavily coloured and did not make the most of the amp's relatively low power output as this system was the least capable of those tested of providing high volumes. No recommendation can be made for this equipment.

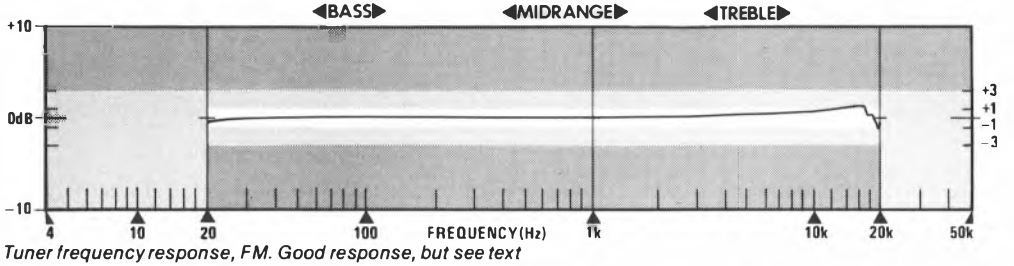
PHILIPS 112

DISC (performance via amplifier)		
Frequency response	30Hz – 16kHz	very good
Stereo separation	– 26dB	good
Distortion	0.3%	very good
Hum and rumble	– 65dB	average
Hiss	– 77dB	very good
Speed variations	0.1%	above average
Speed accuracy	0.7% fast	below average
Tracking ability	20cms/sec	good
TUNER (performance via amplifier)		
Frequency response	20Hz – 20kHz	excellent
Stereo separation	– 32dB	very good
Distortion	2%	very poor
Minimum noise	– 67dB	average
Aerial signal for minimum noise	800uV	average
Selectivity between stations	80dB	excellent
Sensitivity, mono	2.6uV	above average
Sensitivity, stereo	32uV	below average
Signal strength meter levels (4) 4uV (5) 25uV (6) 80uV (7) 250uV		
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Philips Ferro	
Chrome tape setting	UDXL II S	
Metal tape setting	Philips Metal	
Frequency response, record/replay:		
Ferric tape setting	35Hz – 9kHz	below average
Chrome tape setting	35Hz – 13kHz	above average
Metal tape setting	35Hz – 14kHz	above average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	50Hz – 8kHz	average
Chrome tape setting	50Hz – 9kHz	average
Stereo separation	– 52dB	excellent
Distortion	5%	very poor
Noise, Dolby in:		
Ferric tape setting	– 59dB	high OVU level
Chrome tape setting	– 63dB	high OVU level
Metal tape setting	– 61dB	high OVU level
Speed variations	0.1%	above average
Speed accuracy	1.8% slow	appalling
AMPLIFIER		
Power output, per channel	32 watts	medium power
Potential maximum volume with speakers supplied	98dB SPL	
GENERAL		
Rack dimensions	92cm x 46cm x 40cm	
Speaker dimensions	43cm x 25cm x 18cm	
Price	including speakers, £299	

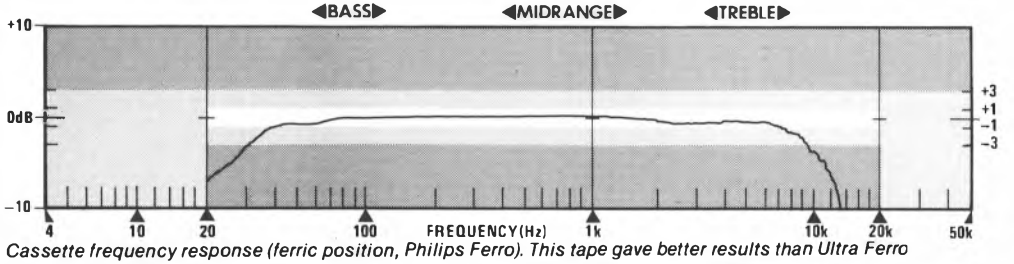




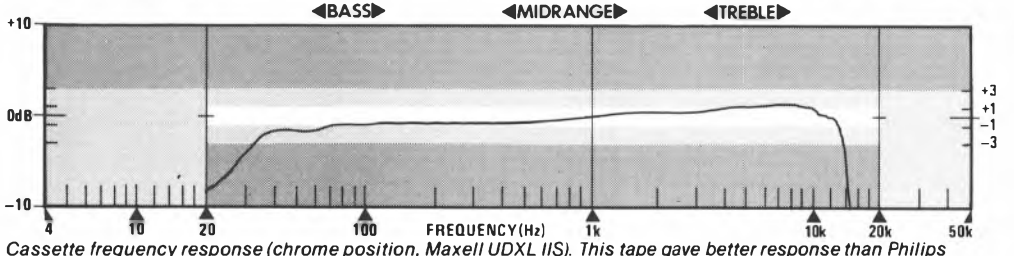
Disc frequency response. Fair cartridge, response apparently affected by amplifier characteristic



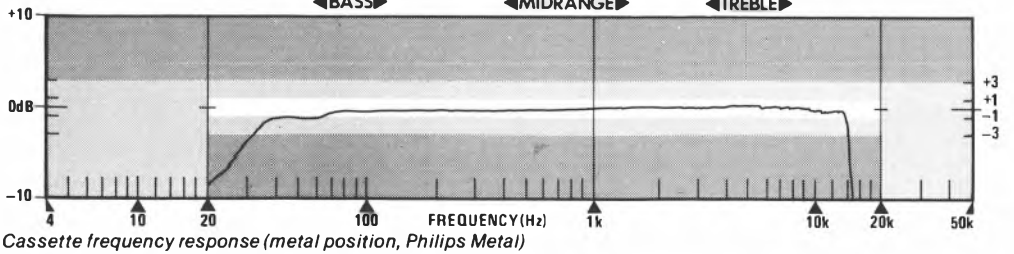
Tuner frequency response, FM. Good response, but see text



Cassette frequency response (ferric position, Philips Ferro). This tape gave better results than Ultra Ferro



Cassette frequency response (chrome position, Maxell UDXL IIS). This tape gave better response than Philips Ultra Chrome



Cassette frequency response (metal position, Philips Metal)

BEST BUY

Pioneer X330

Pioneer High Fidelity (GB) Ltd, Pioneer House, The Ridgeway, Iver, Bucks SL0 9JL
Tel (0753) 652222

Pioneer seem to have moved further than any other hi-fi manufacturer from the separates specialists to an almost exclusive marketing emphasis on rack systems. The X330 rack that features in this review is priced without speakers and is based around the PL-120 turntable, the successor to the biggest selling budget-buy turntable of all time – the Pioneer PL12D.

As this system was supplied by a shop and not the manufacturer, the rack was delivered made up. This tall model, costing roughly £20 more than a smaller alternative design, is finished in a dark rosewood-effect vinyl and fitted with a headphone socket on the plinth. This is connected to a special outlet on the back panel of the Pioneer amp, so that the connecting lead is not seen from the front. The shelf height is fixed and too low for the equipment we reviewed.

Disc

The PL-120 turntable is almost unique among rack system turntables in that it has a pickup arm fitted which has some pretension towards being of true hi-fi specifications. The Audio-Technica-produced cartridge is fitted in a reasonably rigid headshell which is itself held in place by a screw. Unlike the vast majority of Japanese turntables, the PL-120 has a suspended subchassis, and a good mat – which again makes a big change from the run-of-the-mill thin moulding.

The turntable produced excellent speed accuracy and low drift, while the cartridge in this deck proved quiet and hiss free. The only failing to report is again a very poor frequency response, which here seems to be a cartridge problem.

The SA-420 amplifier is unusually styled – it has a function selector knob every bit as big as the volume control. The selected source is indicated with an LED. Two pairs of speakers can be connected to the SA-420, though only one pair can be used at a time. Conventionally designed tone controls offer a 9.5dB cut or boost at 100Hz in the bass and 10kHz in the treble while the loudness control offers a bass lift only.

The balance control gives even panning between the channels which makes a change from the more common control which jumps left to right.

The Pioneer turntable was connected via the SA-420 amp to the reference speakers and tried with the orchestral test piece. The stable firm stereo image heard on test puts this deck way ahead of other turntable systems heard during this project, notwithstanding the frequency balance problems exhibited by the cartridge – which was similar to but more emphasised than the response of the reference Nagaoka MP11. The sound was clean in the treble if a bit rolled off, cello and woodwinds were favoured though the image could sound a little 'recessed'. Rock music had a very good sound quality, having detail in the backing vocals and no fizz or hardness in the top. Every instrument was in its place and there was good clear low frequency extension. On the crossed-pair-miked chamber excerpt this turntable was one of the few to make real sense out of the ambience information captured by the simple microphone technique used to produce this record. The image integrity and placement of instruments fully makes up for the frequency imbalance in this instance. The sound was very close to the reference system – the Pioneer turntable, like the reference deck, exhibiting good isolation properties.

Tuner

The Pioneer TX-520L tuner is a classic example of how 'value engineering' can work. The build quality stops behind the solidly-made fascia, which gets the large portion of the budget – by contrast, the back and bottom panels is hardboard! Test bench measurements showed the TX-520L to be exceptional in all respects with outstanding low noise figures and wide stereo separation for a budget model. The tuning knob had a good flywheel effect and the tuning scale was easy to read though the effect was spoiled by the rather useless signal strength meter which was far too sensitive.

On broadcast speech the TX-520L sounded close to the reference tuner in essential respects but was both lighter sounding and a bit midband-forward in comparison with the reference on male voice. On grand opera the tuner had a rather forward balance, favouring the singers. Stereo imaging was not as smoothly confident as the reference while the treble lacked 'air'. Sound quality overall, however, was considered very good. Medium wave reception was clean though speech was rather nasally coloured.

Cassette

Though it offers full touch-sensitive transport controls, Pioneer's CT-320L cassette deck fails to provide wide enough range meters – they only read down to – 10dB. Fair head access can be achieved with the cassette compartment window removed. A music search facility is provided which as usual looks for four-second gaps in recordings and hence is useless for most classical music programmes. However, the record mute facility allows the user to make up his own unambiguous gaps between items on home recorded tapes. Conveniently, the transport controls allow the machine to go directly into the record pause mode with one button operation which improves over holding down the record and play buttons simultaneously as with some designs.

It almost seems that some manufacturers are afraid of making firm tape type recommendations for their cassette machines and Pioneer's tape listing gives no real guidance as it includes almost every tape manufactured. We found TDK tapes to give good performance (see test results).

Using TDK SA, tapes were made of the orchestral test piece from the reference system for comparison with the original. The CT-320 sounded brighter and 'brassier' than the source but had a good bottom end – something of a rarity among budget cassette decks, which usually suffer either bad low-frequency head saturation or bad head-to-tape contact, spoiling low frequency performance. There was some enhancement of apparent stereo image depth, due to the 2kHz presence-band droop though the trend was gentle. Orchestral strings lacked their extreme treble detail. On rock music there was a shade of boom and thickness, also some overhang in the kick drum transients sound quality was rated as very good, lacking only treble sweetness.

Pre-recorded tape replay caused some problem as it was obvious that the azimuth adjustment of the record/replay head was well out. This is seen as the total lack of top end in the deck's quoted (and plotted) replay response. The deck was aligned on an azimuth adjustment tape before auditioning, as this misadjustment could not necessarily be attributable to the manufacturer as the system was not supplied direct by them. It seems fairest to tell buyers to beware of tape azimuth misalignment and to listen to a pre-recorded tape on the CT-320 they are about to buy to check for gross top loss. The chances are that this adjustment will be correct, but on the evidence of the review sample we must advise caution.

With azimuth realigned for maximum treble output (figures not quoted) there was a good detailed treble to the ferric pre-recorded test tape, with some lack of very high frequencies which could be expected. The chrome rock tape

showed a good detailed top end and a firm neat bass quality – though a little lower midrange boom showed itself in thicker vocals.

Summary

It seemed surprising in view of the amp's ability to deliver 42 watts into a 4ohm load (28 watts into 8ohms) that both pairs of speaker outlets cannot be run simultaneously – the amp seems to have no problems into low impedance loads. Auditioning the amp in isolation showed it to be slightly muffled.

The most pleasing result of this review is to discover that Pioneer are alive and well and still making a good budget turntable with a very good arm and a reasonably designed plinth and suspension system. A better cartridge would put this unit close to the reference turntable in sound quality and it is already fitted with a better mat than the Dual.

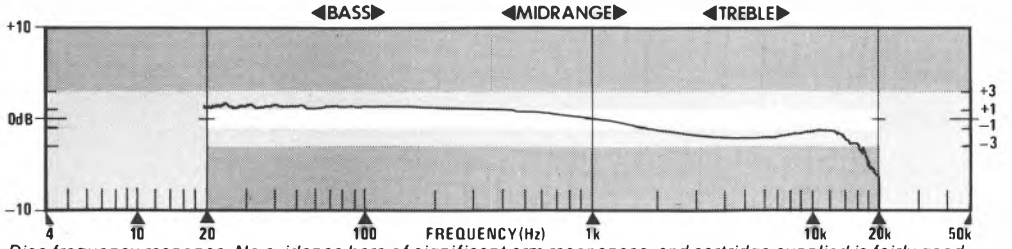
The tuner too seems to have had money spent where necessary to provide a good-looking model, and one which sounds well above average. The silly signal strength meter is the only bad point.

The Pioneer's cassette deck offered good speed and noise performance with excellent stereo separation. Our tests, though, were confused by the alignment problems encountered with the sample we had, but there are no strong reasons to suspect that other samples of this model will be equally badly adjusted.

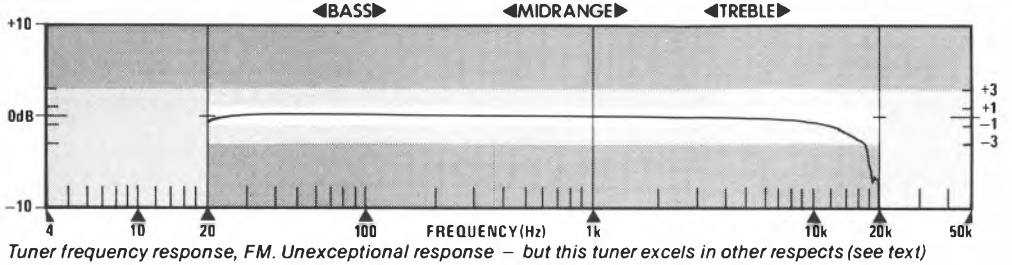
As a disc-playing system, the Pioneer X330T stands out head and shoulders above the other racks tested bar the Dual. The other sources, tuner and cassette, gave well above average sound quality and so at the price a Best Buy rating is demanded.

PIONEER X330

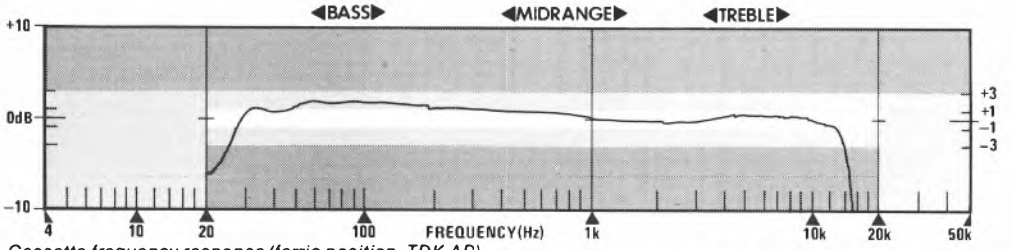
DISC (performance via amplifier)		
Frequency response	20Hz – 2kHz	very poor
Stereo separation	– 24dB	above average
Distortion	0.4%	excellent
Hum and rumble	– 67 dB	very good
Hiss	– 76dB	good
Speed variations	0.07%	very good
Speed accuracy	0.1% fast	excellent
Tracking ability	20cms/sec	excellent
TUNER (performance via amplifier)		
Frequency response	20Hz – 10kHz	below average
Stereo separation	– 53dB	excellent
Distortion	0.1%	very good
Minimum noise	– 77dB	excellent
Aerial signal for minimum noise	1.6mV	average
Selectivity between stations	72 dB	very good
Sensitivity, mono	2uV	good
Sensitivity, stereo	30uV	average
Signal strength meter levels (1) 6.3uV (2) 10uV (3) 20uV (4) 25uV (5) 40uV		
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	TDK AD	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	26Hz – 14kHz	above average
Chrome tape setting	26Hz – 11kHz	below average
Metal tape setting	26Hz – 14kHz	above average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	80Hz – 700Hz	badly adjusted
Chrome tape setting	80Hz – 700Hz	badly adjusted
Stereo separation	– 51dB	excellent
Distortion	1.3%	average
Noise, Dolby in:		
Ferric tape setting	– 61dB	very good
Chrome tape setting	– 59dB	typical
Metal tape setting	– 58dB	typical
Speed variations	0.08%	good
Speed accuracy	0.2% slow	very good
AMPLIFIER		
Power output, per channel	28 watts	low power
GENERAL		
Rack dimensions	89cm x 49cm x 40cm	
Price	without speakers, £320	



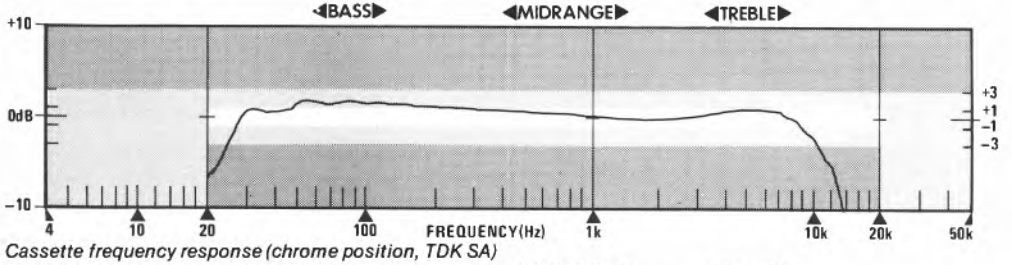
Disc frequency response. No evidence here of significant arm resonances, and cartridge supplied is fairly good



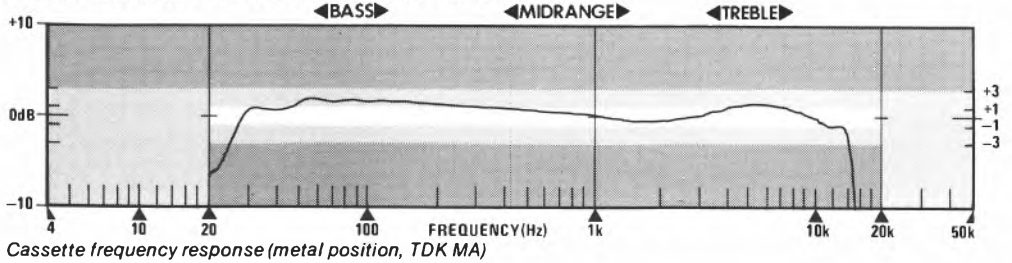
Tuner frequency response, FM. Unexceptional response – but this tuner excels in other respects (see text)



Cassette frequency response (ferric position, TDK AD)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

RECOMMENDED

Rotel A400

Rotel Hi-Fi Ltd, 2-4 Erica Road, Stacey Bushes, Milton Keynes, Bucks
Tel (0908) 317707

Rotel's A400 system has been available for a good time now and is competing in a very active section of the rack system market against more recent designs, though it has an edge in that it offers an amp and tuner (rather than a receiver) at this low price.

The RK-150 audio rack comes broken down and shrink wrapped inside a unreuseable wrap-around cardboard box. The instructions are contained on one large sheet which has good diagrams. The rack is simple to assemble because there are few parts – though there is no preassembly of the door hinges. The castors required a tommy bar to screw them into the plinth but this had been left out in packing and a screwdriver shaft had to be used instead. The chipboard back gave the rack strength though we felt that the cheap grade of black vinyl and sharp edged aluminium trim gave the finished rack a tatty look.

Disc

The RP-400X turntable is a semi-automatic belt drive design offering only the most basic speed change and reject facilities. The straight arm has what looks like a removable headshell – but this proved to be fastened permanently to the arm tube. The 2RL-5 cartridge can itself be removed with the headshell screws if necessary. The stylus guard fitted to the cartridge rattled rather alarmingly when playing and oddly enough the perspex lid of the turntable produced feedback problems when left in the upright position.

The turntable and cartridge combination offered above average performance on all tests but the frequency response plotted through the RA-400 amp showed a severe roll off in the treble to nearly –5dB at 20kHz. Test bench investigation showed this to be due to a high capacitative value on the amp's phono input (49kohm and 320pF input impedance and capacitance were measured when 47kohm and 200pF were to have been expected). This finding suggests that low inductance cartridges will produce a much flatter response with the Rotel amp – Glanz or

Grado designs would suit.

This inaccurate frequency response on disc was easily heard during auditioning and caused the orchestral test piece to sound very dull in strings with a lack of 'air' in woodwind instruments. The sound was very weighty in orchestral bass though the cartridge seemed unhappy about the heavily modulated passages on this disc and offered only insecure tracking. Rock music sounded not at all bad, if dull. Bass was rather overhung, there being a thick quality to plucked guitar – this sound was dull but not unacceptable. The crossed pair miked chamber quintet had a 'distant' image (due to the frequency balance) but separation was good with a fair sense of ambient detail. The turntable proved quite resistant to footfall feedback.

Tuner

The RT-400L tuner offers nothing in the way of extras beyond the MW/LW/FM selector and tuning knob. A wide easy to read tuning scale covers only half the fascia width as the rest of the wide window is taken up with a stereo beacon and signal strength meter of reasonable help. The tuner measured very well for a budget tuner having a particularly low noise and a textbook frequency response.

On broadcast speech the Rotel showed some sibilance and dryness in male voice but had a very open sound and was easy to listen to. On chamber music the Rotel was slightly brighter or perhaps more 'brittle' in the treble than the reference tuner though the sound was otherwise excellent, lively with particularly good stereo imagery. Medium wave reception was rather dry and hard but speech was clear and extended.

Cassette

Once again, only the very basics in facilities are offered on the RD-400 cassette deck. Though a Dolby indicator is provided, for once it would have been better to forego this and use the LED for a peak indicator to supplement the meters, as their slow acting ballistics were not helpful in setting the best record level. Record level inputs controls are ganged to offer easy fades in both channels. Transport controls are of the mechanical piano key variety. No output or record sockets are provided, connections being made through flying leads terminating in phono plugs.

Using Fuji FX-II tape to record the orchestral test piece for playback against the source the sound was found to be slightly dulled on this excerpt. The RD-400 was considered to produce a good sound, except perhaps in the lowest bass which could sound confused. The rock track showed some deadening of cymbal crashes but the sound was again considered good.

On pre-recorded cassette replay the RD-400 was running noticeably fast, while the ferric orchestral tape had a rather midrange-thickened and forward presentation lacking 'air' in strings. The chrome rock tape sounded thumpy in the bass, but the stability of pitch and imagery was appreciated.

Speakers

The RL-400 speakers are two way designs with fixed grilles. The cabinet is made from only 10mm thick material filled with a roll of rag waste while the 40mm paper tweeter and 200mm paper mid/bass unit seem to be wired in parallel without any crossover components. Connections to the speaker are leads taken directly to the back of the drivers and finished with soldered bare ends for connection to the amp.

In-room response plotted below shows the lack of integration between the two driver units, caused by the lack of a crossover of any sort. The tweeter peaks around 8kHz while there is a deep suckout centred on 3kHz between the tweeter's lowest possible response and the highest frequency output of the mid/bass driver.

One speaker of the RL-400 pair was found faulty when connected up. Unfortunately, as the Rotel speaker listening tests came at the very end of the test schedule, another could not be substituted in time. So a side-by-side mono comparison with the reference speaker on the reference system was used to gain information about the speaker's colouration. The midband was very hollow no doubt due to that deep suckout, bass was boomy and the treble quality of strings was tinny. Using the same orchestral test piece the Rotel turntable and amplifier were used to ascertain the difference between the reference and Rotel systems through the Rotel speaker and the qualities of the Rotel disc system with its own speakers. The sound was found to be very fatiguing with a emphatically tinny sound in strings and a very hollow boxy midband with loose bass.

No information could be obtained on the stereo performance of the RL-400 speakers with only one working but it was felt that the very high colouration levels shown by the speaker was strong enough evidence against them.

Summary

Even though the speakers supplied offer a singularly uninspiring performance, this shouldn't detract from the strengths of the rest of the system. The other area of criticism is the cartridge/amplifier combination, as there is an electrical mismatch between these components which results in a very dull treble quality. If Rotel aren't prepared to lower the input capacitance on the disc input of their RA-400 amp they should be prepared to offer a low inductance cartridge

in place of the fitted model to achieve the potentially flat response of which the amp is capable. The fitted cartridge is not at fault, but suffering from too high a capacitative load to keep its treble up!

Performance of the tuner was most impressive considering its price as part of the total budget. The cassette deck too was competent and could offer good sound quality on record/replay but the replay only response and inaccurate speed on the review sample argue against it for pre-recorded tape replay.

Taking into account the potential results which could be obtained by changing the speakers and cartridge, and the obvious qualities of the other components in the systems, recommendation cannot fairly be witheld at the price.

ROTEL A400

DISC (performance via amplifier)

Frequency response	20Hz – 2.5kHz	matching problem
Stereo separation	– 24dB	above average
Distortion	1.1%	average
Hum and rumble	– 67dB	very good
Hiss	– 76dB	good
Speed variations	0.1%	above average
Speed accuracy	0.1% fast	excellent
Tracking ability	16cms/sec	average

TUNER (performance via amplifier)

Frequency response	20Hz – 19kHz	excellent
Stereo separation	– 37dB	very good
Distortion	0.7%	average
Minimum noise	– 74dB	excellent
Aerial signal for minimum noise	1.6mV	below average
Selectivity between stations	68dB	above average
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	36uV	below average

Signal strength meter levels (1) 20uV (2) 63uV (3) 160uV (4) 250uV (5) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I
Chrome tape setting	Fuji FX II
Metal tape setting	TDK MA

Frequency response, record/replay:

Ferric tape setting	20Hz – 15kHz	good
Chrome tape setting	20Hz – 14kHz	average
Metal tape setting	20Hz – 15kHz	good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	80Hz – 9kHz	average
Chrome tape setting	80Hz – 10kHz	average
Stereo separation	– 56dB	excellent
Distortion	2.4%	bass distortion

Noise, Dolby in:

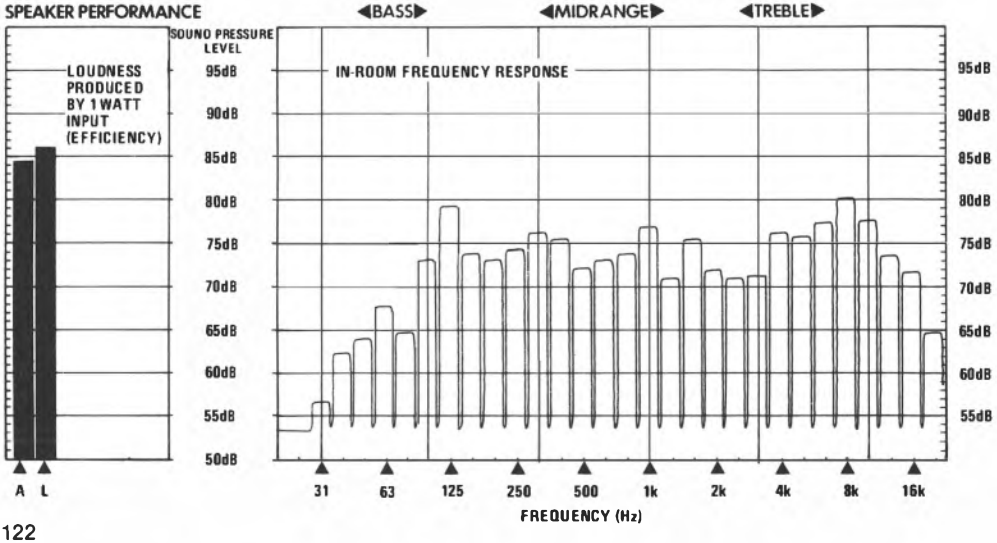
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 56dB	poor
Speed variations	0.08%	good
Speed accuracy	1.2% fast	very poor

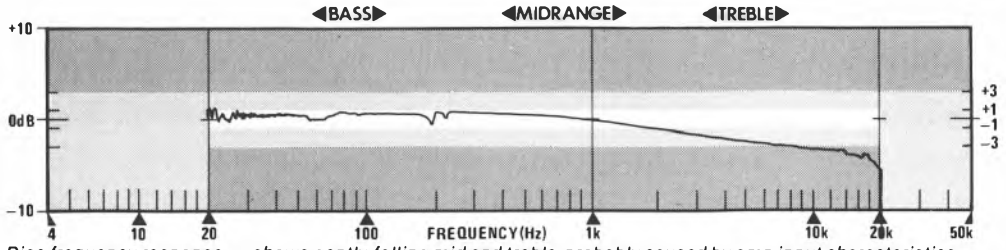
AMPLIFIER

Power output, per channel	32 watts	medium power
Potential maximum volume with speakers supplied	102dB SPL	

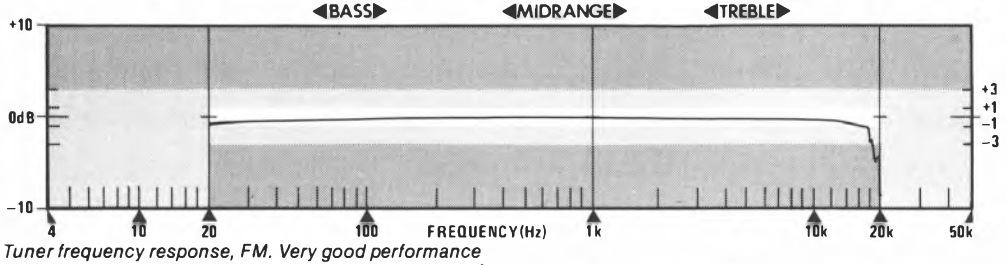
GENERAL

Rack dimensions	75cm x 47cm x 40cm
Speaker dimensions	45cm x 25cm x 22cm
Price	including speakers, £320

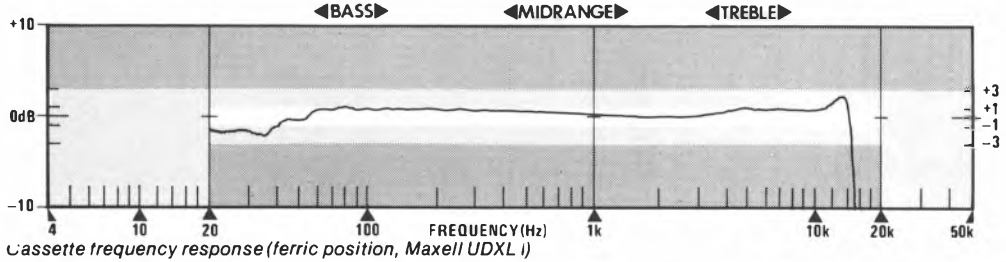




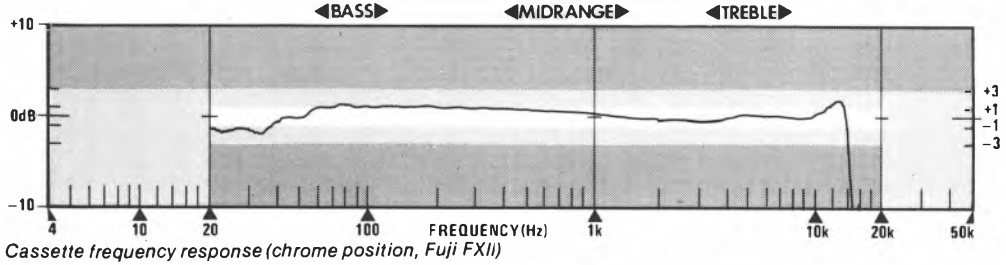
Disc frequency response – shows gently-falling mid and treble, probably caused by amp input characteristics



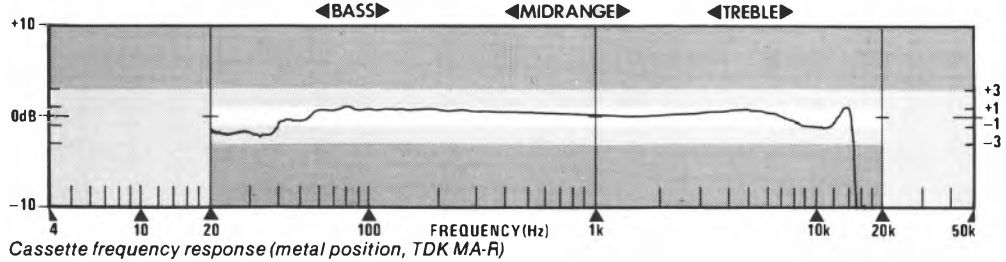
Tuner frequency response, FM. Very good performance



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, Fuji FXII)



Cassette frequency response (metal position, TDK MA-R)

Rotel Micro 90

Rotel Hi-Fi Ltd, 2-4 Erica Road, Stacey Bushes, Milton Keynes, Bucks
Tel (0908) 317707

As reviewed here, the Rotel Micro 90 system is complete with an infra red remote control receiver and hand set transmitter. The equipment is also available for £100 less without the remote controller. Rotel suggest the use of their RP-700 turntable with this as it too can be remotely controlled from the RMR-90 remote control receiver. So we assessed the performance of this turntable in the context of the system as supplied. The RP-700 costs an £99.

Disc

The Rotel RP-700 turntable has a quite substantial plinth, a good platter mat and clear strobe. The deck has two motors. One is for the platter and is a direct drive type offering pitch control. The other is for arm automation. The straight arm comes fitted with a low-mass Audio-Technica AT51 cartridge which is of reasonably low compliance and is designed to track at 1.5 gram. The RMR-90 remote control receiver is connected to the RP-700 turntable through one cable only which allows fully automatic start and reject facilities.

The turntable and cartridge system proved to measure well in every respect except the frequency response which showed a large bass plateau with a dip through the treble to a high frequency peak.

The RMA-90 amplifier offers just the basic hook-up facilities for one tape deck, a tuner, a record player and an auxiliary input. Though two pairs of speakers can be permanently connected to the amplifier only one pair can be used at a time – and the switch to select which pair of speakers will be used is inconveniently situated on the back panel of the amp. Volume and balance are controlled by the concentric knobs to the right of the fascia while the row of input selector micro switches have neat LED indicators above. An LED power meter with a protection indicator is provided.

Through the reference speakers the Rotel turntable and amplifier combination produced a very dull sound lacking both detail and 'air' in string tone in the orchestral test piece. The

stereo image was not convincing and tracking seemed insecure. The rock track showed the system to have a fair balance with this type of programme. Importantly, the system allowed the listener to feel the rhythm moving along well though vocals were chesty. Bass showed a slight overhang effect but the sound was good overall. The crossed-pair-miked chamber piece had a good basic sound but it was a pity the system's frequency balance so distorted the perceived image depth. The cartridge showed good separation and lateral imaging.

Tuner

Rotel's RMT-90L is a true digitally synthesised tuner with quartz locking and six presets which can accommodate one FM and one AM station each. The presets hold their tuned station when the unit is switched off for up to three days. The signal strength meter with three segments only is really no use as only the third indicates a sensible signal level.

There were no measurement problems on the test bench though the tuner's frequency response as measured through the amplifier showed an unusual dip from midband through the treble. On broadcast speech the Rotel sounded clacky and edgy in comparison with the reference tuner while the stereo image was disturbed by the frequency balance. Orchestral music lacked the presence of the reference with string tone sounding dull. But though the sound through the Rotel lacked weight and a completely convincing stereo image it was nevertheless good. Medium wave reception was noise-free, but speech on MW was dull.

Cassette

The Rotel RMD-90 cassette deck takes its power from the Rotel amplifier and cannot be used in isolation from that equipment. The forward loading cassette compartment ensured good head access for cleaning. The LED record level meters cover a wide dynamic range while the level controls were ganged to offer easy fades. Transport controls are touch sensitive and a memory repeat facility allows the machine to spool back to the 000 counter setting at the end of play and to repeat that portion again.

Using TDK SA tape the RMD-90 produced a recording which was much brighter and brassier than the source – this shrillness spoiled an otherwise good sound. The stereo image was boxy and again spoilt by the frequency balance. The rock track had a boomy boxy bass quality, a forward vocal line and fizzy cymbals.

On pre-recorded cassette replay the RMD-90 sounded much better with good stereo imagery and an even frequency balance with some reedy brightness in strings. The chrome rock tape sounded bright and lively, if a bit uncontrolled in the low bass.

Speakers

Built in the UK, the RML-92 miniature speakers supplied with the Micro 90 system are reflex loaded two-way units. The design incorporates a 25mm diameter cloth dome tweeter made by Philips and a 110mm paper mid/bass driver which is loaded by a 30mm diameter port and tunnel let through the baffle. The cabinet is made of 14mm chipboard, with acoustic fibre wadding filing the enclosed air space. The crossover on the prototype samples we auditioned consisted of 6 elements carried on a printed circuit board with a further two components wired across the tweeter. Rotel have obviously specified hi-fi standards of performance, materials and construction.

The in-room plot shows a lack of fundamental bass weight which could have been expected from a small reflex design. The overall trend of the speaker's response is a gently rolled-off dullish balance.

Listening to the orchestral test piece confirmed this though the string tone was better described as smooth, rather than dull. There was some emphasis of mid tones while the speakers produced an open image with good front-to-back depth. Rock music was rather lightweight, as could have been expected, though vocals were clean if a bit forward. The bass from low-register electric bass and drums caused the reflex port to chuff a bit at high level replay. The string quartet had a sweet string tone with a fair sense of the recorded ambience and good imaging though the cello could boom in its lower register. The crossed-pair-miked chamber piece showed a rather thickened horn tone and a loss of 'air' in the treble of woodwinds.

The disc system's frequency response imbalance already noted spoiled the basic quality of the RML-92 speakers. With the orchestral test piece the Rotel system and speakers had a very hollow treble sound and a 'small' sound image which made this disc sound very dated. The rock test track had a very undynamic sound with a boomy bottom end, if a detailed midrange. Treble was dulled and there was a lack of sparkle in cymbals. The dull top end response spoiled the percussive sound of solo piano.

Remote

Rotel's RMR-90 infra red remote control receiver is equipped with IEC mains sockets and plugs to enable the whole Micro 90 system to be remotely powered and this does away with the need for more than one mains lead. The remote signal switching operates in the tape monitor loop but

excludes the auxiliary input.

The RRT-1 hand controller covers power, source switching, station selection on the tuner, turntable start/stop and cassette transport, as well as controlling volume and giving the extra facility of a volume mute.

Summary

If the frequency response problems of the cartridge are excluded from the analysis – the RP-700 turntable is after all an optional extra to the system package – the Micro 90 becomes a better proposition. The amp offered a healthy 50 watts from compact dimensions, though it tended to sound boomy in the bass when auditioned in isolation.

The tuner offered competent sound quality although it suffered from a frequency response problem of its own. The cassette deck performed better with pre-recorded tape replay than it did on record/replay. The RML-92 speakers proved to be a cut above many small speakers sold as 'separates' and were preferred to almost all other rack system speakers with a smooth sound, though they were neither capable of producing deep bass nor very high levels.

The remote control offers extra facilities for the amp's volume control and the convenience of remote powering. Overall though the system didn't warrant unrestricted recommendation at this price though the amp, tuner and cassette deck could make up a recommended heart of a small system with another brand turntable and bigger speakers.

ROTEL RM90

DISC (performance via amplifier)

Frequency response	35Hz – 2.5kHz	very poor
Stereo separation	– 31dB	good
Distortion	0.9%	above average
Hum and rumble	– 68dB	excellent
Hiss	– 78dB	excellent
Speed variations	0.04%	excellent
Speed accuracy	0%	excellent
Tracking ability	25cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	20Hz – 15kHz	above average
Stereo separation	– 45dB	excellent
Distortion	0.24%	good
Minimum noise	– 69dB	above average
Aerial signal for minimum noise	400uV	very good
Selectivity between stations	62dB	average
Sensitivity, mono	2uV	good
Sensitivity, stereo	20uV	very good

Signal strength meter levels (1) 6uV (2) 20uV (3) 200uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	TDK AD	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	

Frequency response, record/replay:

Ferric tape setting	30Hz – 14kHz	above average
Chrome tape setting	30Hz – 14kHz	above average
Metal tape setting	30Hz – 15kHz	good

Frequency response, replay of pre-recorded tapes:

Ferric tape setting	40Hz – 12kHz	excellent
Chrome tape setting	40Hz – 12kHz	excellent
Stereo separation	– 52dB	excellent
Distortion	2.6%	below average

Noise, Dolby in:

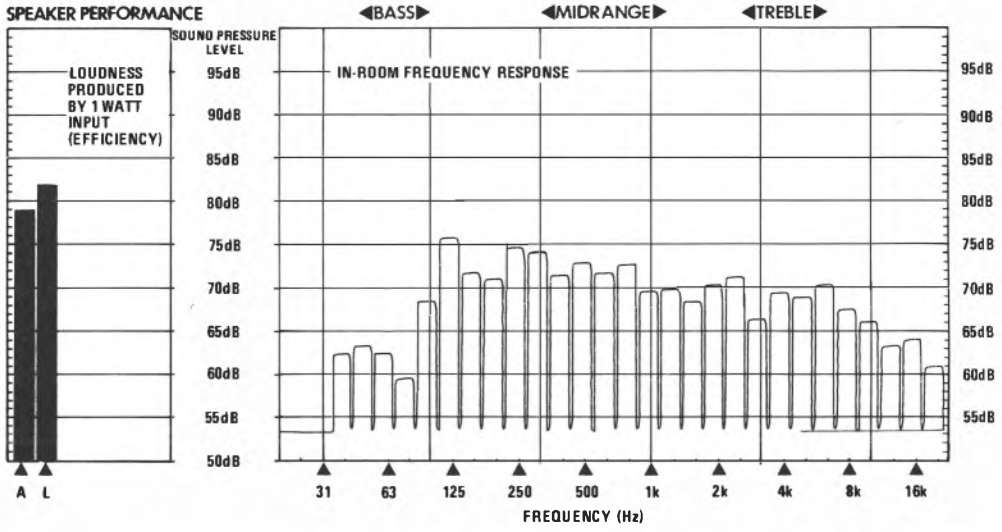
Ferric tape setting	– 62dB	high OVU level
Chrome tape setting	– 62dB	high OVU level
Metal tape setting	– 61dB	high OVU level
Speed variations	0.06%	very good
Speed accuracy	0% slow/fast	excellent

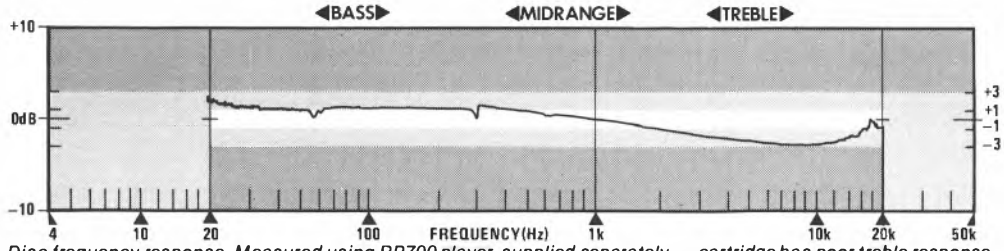
AMPLIFIER

Power output, per channel	50 watts	medium power
Potential maximum volume with speakers supplied	99dB SPL	

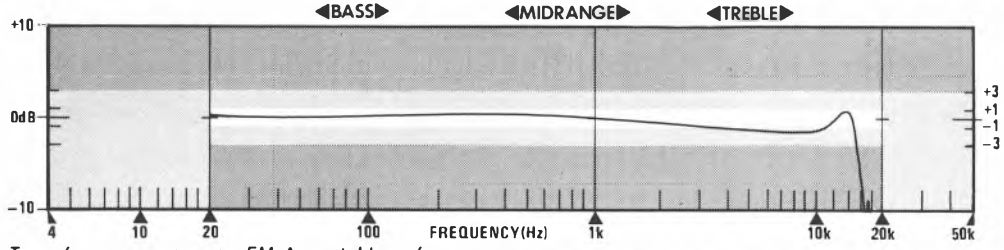
GENERAL

Dimensions	31cm x 28cm x 26cm
Speaker dimensions	31cm x 18cm x 17cm
Price	including speakers, £499

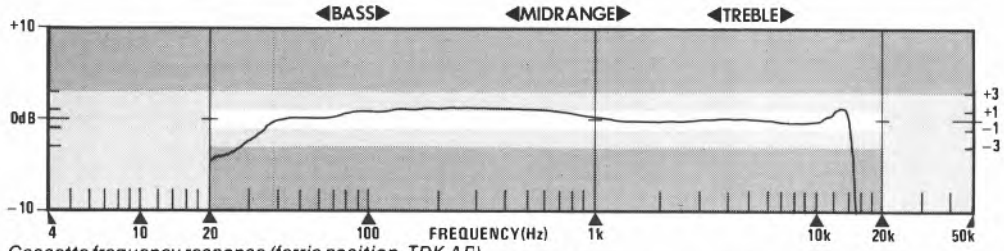




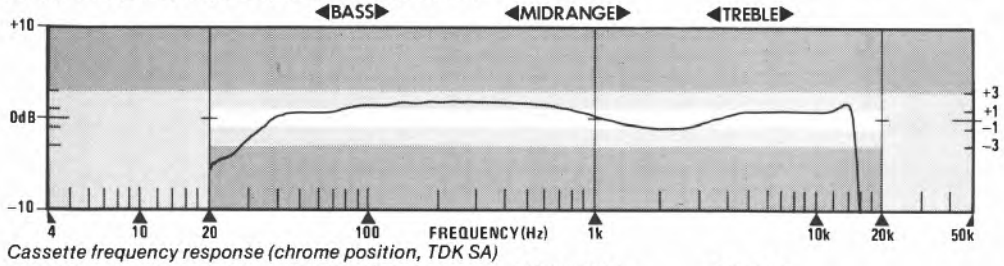
Disc frequency response. Measured using RP700 player, supplied separately – cartridge has poor treble response



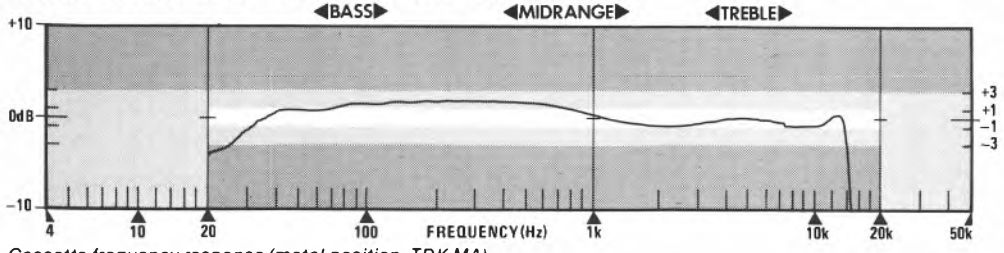
Tuner frequency response, FM. Acceptable performance



Cassette frequency response (ferric position, TDK AD)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

RECOMMENDED

Sansui 1100

Sansui Audio Europa NV, Unit 10A, Lyon Industrial Estate, Rockware Avenue, Greenford, Middlesex UB6 0AA
Tel 01-575 1133

Sansui's 1100 system is the new season's successor to the very successful system based around the SR222MkII turntable, AU217/TU217 amp and tuner combination and SC1100 cassette deck which featured on the cover of the last edition of *Hi-Fi Choice: Systems* and was considered a classic budget Best Buy.

The GX-65 audio rack came fairly well packed in a rather squashy box and though the supplied instructions were clear there was no information on where to place the shelves. But assembly was easy and with the back firmly in place the rack proved to be quite stout. The vinyl was rather tacky with a bad finish on some edges and the glass chipped on one door. The double doors do look good but the equipment has to be loaded into the rack from the rear as it is too wide to pass between the doors.

Disc

Sansui's FR-D25 turntable is a belt-driven model with a servo-controlled motor which allows pitch control to be offered. Strobe markings on the platter can be seen through the central window in the plinth. An S-shaped arm is fitted with a conventional SME-type headshell though this is made of bendy plastic. The arm mass seemed rather high for the compliance of the fitted cartridge though the combination offered fine tracking on the test bench.

The Sansui 1100 is a receiver based system and the R-5L amp section offers only the most basic facilities, there being no second tape facility and more surprisingly no auxiliary input either. Two pairs of speakers can be connected to the receiver though only one pair can be used at once which was thought surprising for a 36 watt receiver, until the poor power delivery of only 42 watts into a 4ohm load was considered (an ideal amp would double its power into a 4ohm load from the 8ohm figure).

Using the reference speakers the Sansui turntable and receiver were first auditioned on the orchestral test piece. The fine tracking performance was not really confirmed on this disc as the cartridge sounded spitty and

insecure on brass instrument transients. The sound was very shrill in the high frequencies though the overtone richness of instruments was lost. The stereo image sounded artifically deep due to the sucked out treble response, though stereo separation seemed good. String tones were very coloured.

The rock excerpt showed up the system's high frequency peak in an edginess in cymbals. The sound was well detailed but sounded heavily 'equalised'. Bass line and drums were prominent but neat. The crossed pair miked chamber recording showed good image location but the image depth was distorted by the system's frequency balance. Woodwinds showed a lack of bloom in their overtone structure. The turntable proved very susceptible to judder from footfall.

Receiver

The tuner section of the R-5L receiver has a very clear well-illuminated full length scale and tuning is easy with the centre tune LEDs fitted to the pointer. With careful tuning using this indicator a low distortion could be obtained. In other respects the tuner measured well except for an early bass roll-off. On broadcast speech the tuner was considered to give an excellent sound quality, close to the reference though lacking weight in male voice and with some slight loss of detail of the studio ambience.

On large scale choral music the image seemed to be pulled to left and right and though there was again some lack of presence through lost weight in the lower frequencies the sound was very good. Medium wave sounded slightly thicker than the reference but was very clear nevertheless.

Cassette

There were one or two nice touches on the D-95M cassette deck, considering it is a budget model – particularly liked were the coupled play/record keys in the transport controls, which mechanically achieve a convenience that other manufacturers only obtain with more expensive electromechanical transport actuators. The meters, though looking like extra-wide dynamic range devices have twin points lighting for each division and are really only 9 point meters – but they do read high enough to get the best out of metal tape treble headroom.

There is no cassette compartment light though and no Dolby indicator while the unganged left and right record level controls are just close enough to get an even fade with one hand.

The instruction manual supplied with the cassette deck is of no help when it comes to recommending tape types as it gaily lists TDK D, AD and OD tapes as being suitable for the 'normal' bias/EQ setting – patently silly considering these tapes require quite different bias settings.

Using TDK SA tape for the record/replay test, the orchestral record when taped and compared against the source showed a good flat response, though some grainy noise intruded. The rock test piece showed a slightly thickened bass quality and some splash in cymbals, but again the general sound was close to the source confirming the good frequency response characteristic shown in the graph.

Sadly, pre-recorded tape replay proved disappointing. The ferric orchestral test tape showed a lack of weight with a very dim treble quality. The chrome rock tape lacked impact at the bottom end while the sound overall was dull and lacklustre.

Speakers

Sansui's S-23 speakers are West German built using Japanese drivers, which appear to be shipped already mounted on the baffle. The grille is not removable and the cutout over the tweeter forms a deep tunnel, which one would expect to spoil treble dispersion. There is no real crossover in this design – merely a series capacitor to protect the paper cone tweeter from low frequency signals. The midbass driver is a 140mm diamater paper pulp design. The cabinet is made from 12mm chipboard and there is no damping applied to the panels.

On the reference system these speakers confirmed in audition the very midrange-forward response shown up in the in-room plot. The bass suffered a 'bong' colouration while the treble was severely rolled-off, resulting in a dim sound. But for this class of speaker, the sound wasn't considered bad. On rock music the cymbals and plucked guitar were leaden with vocals being very shouty and forward – cymbals had no crash. The string quartet sounded boomy and resonant particularly the low register of viola and cello. The supressed treble output dulled down string tone, and the balance of the speaker tended to push the image out forward at the listener. The crossed pair miked chamber music excerpt sounded very dull with the instruments apparently playing in a hollow acoustic rather than being accurately located in a reverberant space. The oboe and clarinet had strong fundamental tones but little overtone richness.

The Sansui turntable and receiver were next played through the S-23 speaker with the orchestral test piece. This sounded boomy and 'fat' with a thickened string tone and evident dip in the presence band. The sound was not fatiguing, though heavily coloured. Rock bass sounded cardboardy and boomy and overall this

excerpt was considered to sound very poor. Piano reproduced with a dull, dead quality with no treble information at all while in climaxes the sound was reduced to a confused undynamic jumble.

Summary

The receiver's amp section was auditioned in isolation via the reference system, where it sounded clean and exciting. The potential of this system can be realised with the fitting of a better cartridge (and headshell) though care needs be taken to select a lower compliance design than the one fitted.

The tuner section of the receiver impressed on auditioning and measured well while the provision of bare wire twist-to-lock connectors for aerial inputs and speaker cable was thought excellent. The R-5L's styling must take an award for classical, clean and unfussy design.

The cassette deck was easy to operate and could produce excellent quality recordings once the correct tape was chosen (buyers note recommendations). Sadly, the D-95M proved less successful with pre-recorded tape having a very midrange prominent sound.

The speakers didn't quite fall into the 'appalling' category, by virtue of their treble output being low – better that fault than the shrieking treble which so many other rack system speakers exhibit. While the speakers will not satisfy in the long term their sound is not going to prevent recommendation of this system. £40 can be saved by buying this equipment without speakers as the Sansui 1000 system, and the R5-L will provide power enough for many good designs.

SANSUI 1100

DISC (performance via amplifier)

Frequency response	400Hz – 4kHz	very poor
Stereo separation	– 30dB	good
Distortion	1%	average
Hum and rumble	– 66dB	good
Hiss	– 75dB	above average
Speed variations	0.14%	below average
Speed accuracy	0.3% fast	average
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	60Hz – 19kHz	excellent
Stereo separation	– 42dB	very good
Distortion	0.4%	above average
Minimum noise	– 70dB	good
Aerial signal for minimum noise	1.2mV	below average
Selectivity between stations	81dB	excellent
Sensitivity, mono	3.5uV	below average
Sensitivity, stereo	50uV	very poor

Signal strength meter levels (1) 25uV (2) 50uV (3) 80uV (4) 200uV (5) 400uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I
Chrome tape setting	TDK SA
Metal tape setting	TDK MA

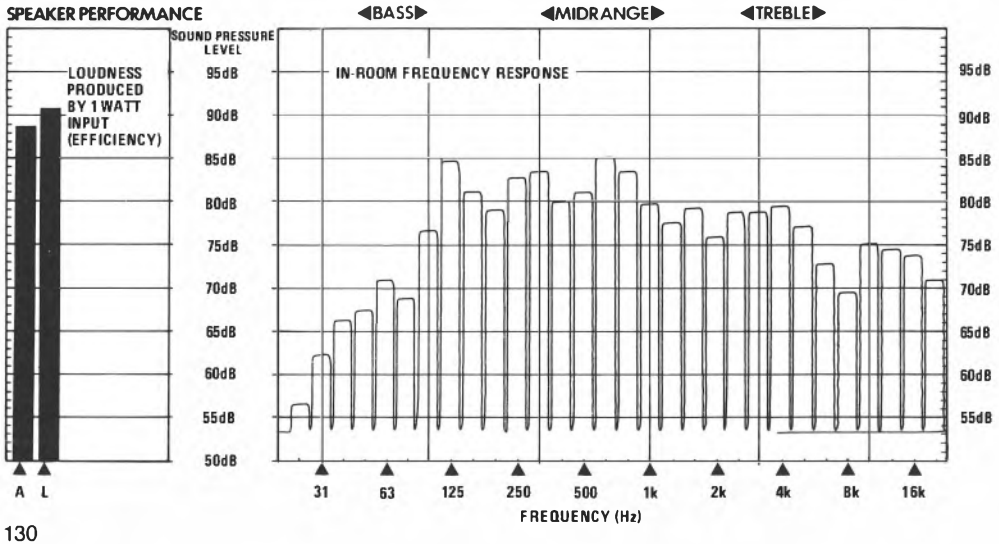
Frequency response, record/replay:		
Ferric tape setting	40Hz – 12kHz	average
Chrome tape setting	40Hz – 13kHz	average
Metal tape setting	40Hz – 13kHz	average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	100Hz – 6.3kHz	poor
Chrome tape setting	100Hz – 6.3kHz	poor
Stereo separation	– 48dB	excellent
Distortion	2%	below average
Noise, Dolby in:		
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 58dB	typical
Speed variations	0.14%	below average
Speed accuracy	0.5% fast	below average

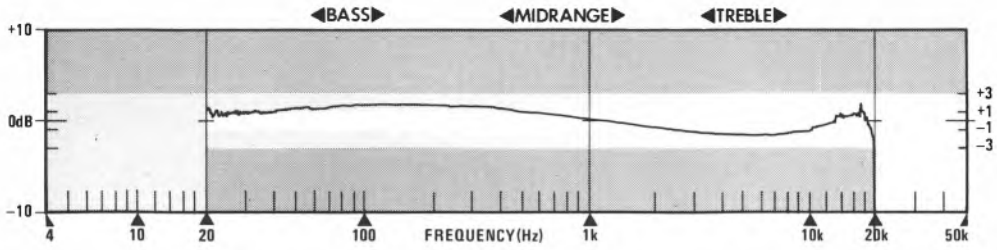
AMPLIFIER

Power output, per channel	36 watts	medium power
Potential maximum volume with speakers supplied	107.5dB SPL	

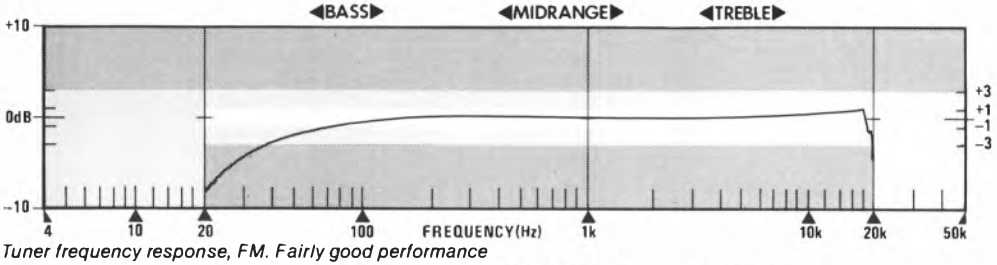
GENERAL

Rack dimensions	76cm x 48cm x 38cm
Speaker dimensions	47cm x 25cm x 21cm
Price	including speakers, £318

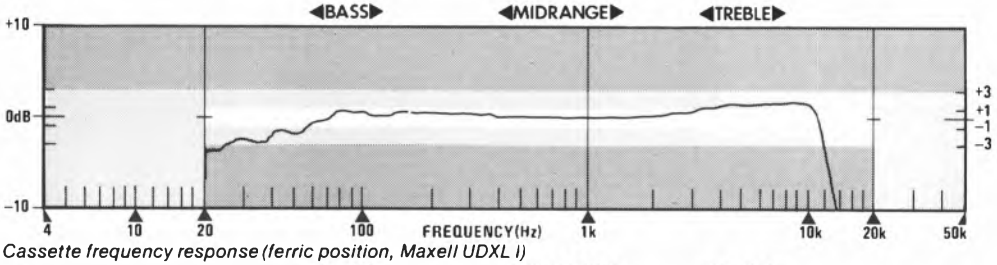




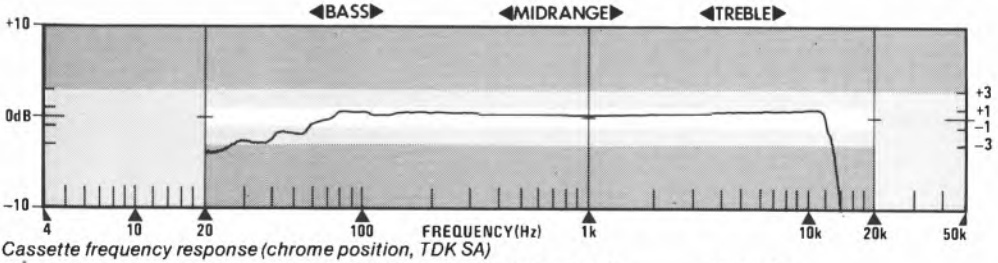
Disc frequency response



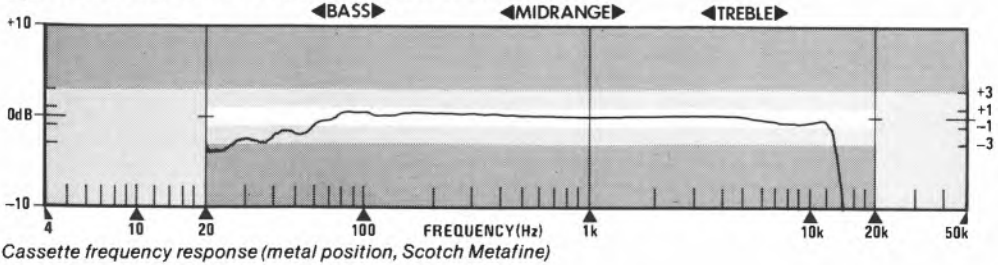
Tuner frequency response, FM. Fairly good performance



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, Scotch Metafine)

Sansui 9900

Sansui Audio Europa NV, Unit 10A, Lyon Industrial Estate, Rockware Avenue, Greenford, Middlesex UB6 0AA
Tel 01-575 1133

Sansui's 9900 system is their current top-of-the-range rack offering full remote control and record track selection. The GX-95 rack comes stoutly packed as it should for such a heavy unit. The instructions are clear and contained on one large sheet, but, more importantly, contain shelf position suggestions for different combinations of equipment.

The GX-95 was easy to assemble – much pre-assembly on door hinges and so on was already done. Stability of the rack was fair considering its height though the heavy glass lid meeting the top of the glass door was not considered too safe for some households. The vinyl was no better than average with a 'plasticky' look, though Sansui provide cosmetic strips for the insides of the rack.

Disc

Sansui's FR-D55 turntable is intended to bring programmable cassette deck track location convenience to the record player. The track sensor is fitted on an outrigger in front of the headshell, from where it senses the reflective change in the vinyl surface of the record between tracks. In practice a three-position sensitivity switch has to be provided to achieve consistent track selection on picture discs, coloured disc or even wide dynamic range discs (direct cut or super fidelity recuts etc). The music selection switch bank on the turntable's front allows you to programme in the track numbers in the order you wish to hear them from 1 to 7.

The cartridge fitted tracked well on test but its response showed a high frequency peak above 10kHz. The turntable motor section measured well.

The A9 amplifier features motorised volume control setting and a switchable moving coil cartridge phono input for low-output mc cartridges. Two pairs of speakers can be connected though they cannot be used together. A high filter is provided, and proved severe in its treble attenuation. Rather better was the variable loudness contour which overcomes criticisms of the usual fixed value boost which is

only appropriate over a narrow range of volume settings. A second tape input (phono sockets) is provided on the front panel – good for a rack system amp.

The power meters were found oversensitive, and with the motorised volume control seemed more for show than convenience – on the review sample the motor of the volume control caused audible noise from the speakers when operated.

Using the orchestral test piece to assess the Sansui turntable and amp through the reference speakers, the treble peak (seen in the disc response graph) was audible as a fatiguingly hard edge in string tone, and a shrill whistly colouration in brass. Rock music was 'spitty' and tizzy in the treble though the midband was fairly detailed and the bass tight. The wind quintet recording suffered from a hard bright treble in the woodwind instruments – bad mistracking was emphasised by the cartridge's frequency response though it seemed that the mistracking was due to the turntable's susceptibility to skip and bounce on the tall rack.

Tuner

Sansui's T-9 tuner is a true digitally synthesised tuner with quartz locking. This technique provides auto scanning while six presets can be set up for one FM and one AM station each.

The T-9 is provided with a 'Just' tuned light which is meant to come on when a station is accurately received – on our sample this system was shown to be misaligned. On the test bench the Just tune window was found to be 52kHz wide but it was offset below the correct frequency lighting between 89.95 and 90.00MHz on an exact 90MHz signal which means that by relying on the 'Just' tuned indicator the user would accurately undershoot the station by 50kHz every time.

On broadcast speech, in comparison with the reference tuner, the Sansui sounded slightly drier than the reference and lacked some bass weight but the comparison was close, and the Sansui considered good. On small scale classical string music the tuner had a less precise image than the reference and low frequency ambience was missing. Medium wave reception was a bit noisy, sound quality being a bit boomy and thickened.

Cassette

The Sansui D-300M cassette deck features soft touch transport controls and automatic programme search which can be switched to play back after fast forward or rewinding or to stop the tape at the start of the programme being played or the start of the next piece. The peak level LED meters had a useful range reading to +8dB.

Using TDK SA tape, the orchestral test piece was recorded and replayed against the original source. The resulting sound was slightly hard with a grainy treble and some lack of orchestral weight. The rock test piece sounded close to the original, though with some bass boom and splash in cymbals. Ferric pre-recorded tape replayed had a good sound quality with a tendency to a treble and upper-mid-forward balance, though this couldn't be said to be bright. The chrome EQ rock tape sounded mid-forward but again the trend was gentle.

Speakers

Sansui S-53 speakers are built in West Germany and incorporate a 50mm paper cone tweeter, a 125mm diameter midrange unit and a 265mm paper bass unit. The tweeter has a plug-in plastic 'acoustic lens' and a level control. The midrange unit is covered by a metal mesh while the bass unit is loaded through two large reflex ports with tunnels let through the baffle on either side of the tweeter. The crossover, of four components, acts at 2kHz and 7kHz and is mounted on the wall of the 14mm chipboard cabinet which is itself unbraced and undamped. The grille frame is very deep, which would have some effect on treble dispersion – though the tweeter's dispersion will already be affected by the recess in which it sits and the acoustic lens over it.

The S-53 produced a very badly coloured sound on the reference system. Orchestral music had a tizzy treble with a hollow resonant midband and a cardboardy, boomy bass. Rock music was 'impressive' but fatiguing with tizzy cymbals and boomy bass, making the kind of sound that scores in a demo room but becomes wearing at home. The string quartet tone was hollow and synthetic with a boxy violin tone. The crossed pair recording of the wind quintet had a smeared image and dreadful colouration.

Playing the S-53s with the Sansui A-9 amp and disc front end produced a papery, screaming treble in the orchestral test piece which had no sense of acoustic or real image. Rock cymbals were 'splatty' with guitar and vocals treated to a boxy nasal colouration. The uneven response charted by the in-room measurement showed up in the solo piano test piece as a clangy tone with a muddled 'bumble' in left hand bass notes – there was no sense of dynamic development.

Remote

The RS-7 remote control receiver is mounted into the rack with the other equipment and offers power outlets so all the equipment can be switched on and off remotely. The connection for the signals is made through the tape monitor circuit of the A-9 amp and this has to be set up to

'Phono' and 'Tape Monitor' before the Remote can switch the other sources – the signal leads from which are plugged into the remote control receiver, not the amp.

The hand controller offers power on/off, full record, replay and transport functions on the cassette deck, the selection of presets 1 to 6 on the tuner and the selection of tracks 1 to 7 on the disc player. In addition the remote system offers a volume control muting circuit which is not available on the amp alone. The remote system operates simply and smoothly once the amplifier source selectors are set up correctly.

Summary

The Sansui 9900 system succeeds in offering convenience of operation – but the cost is mediocre disc sound quality despite the basic player's good performance. A better cartridge and no track selection would seem to offer better long term value.

The tuner offered good sound quality with no quirks of operation while the cassette offered good record/replay performance but only fair replay of pre-recorded tape, and it did run nearly 1% fast.

The speakers offered looks, size and volume but suffered from unacceptably high levels of colouration. Their only saving grace is perhaps the very high potential maximum volume which can be achieved with the amp's 90 watts.

In view of the speaker colouration levels this system cannot be recommended as it stands. With this package, even without the speakers, money is being spent on elaborate remote control and the dubious convenience of record track selection, rather than on basic sound quality.

SANSUI 9900

DISC (performance via amplifier)

Frequency response	20Hz – 8kHz	average
Stereo separation	– 22dB	average
Distortion	0.8%	good
Hum and rumble	– 65dB	average
Hiss	– 74dB	average
Speed variations	0.04%	excellent
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	30Hz – 14kHz	average
Stereo separation	– 36dB	good
Distortion	0.15%	very good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	1mV	typical
Selectivity between stations	68dB	above average
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	35uV	below average

Signal strength meter levels (1) 20uV (2) 25uV (3) 50uV (4) 125uV (5) 200uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Maxell UDXL I
Chrome tape setting	TDK SA
Metal tape setting	Scotch Metafine

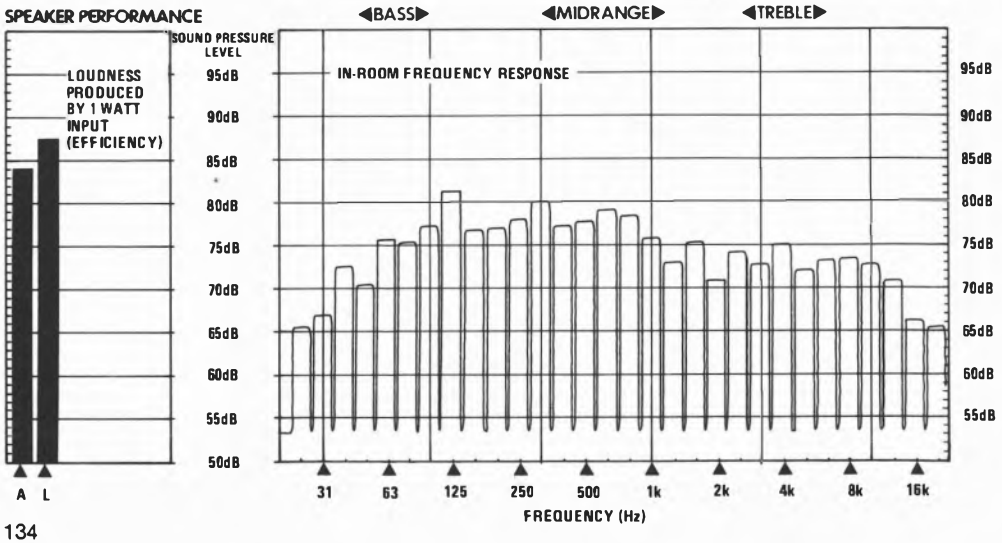
Frequency response, record/replay:		
Ferric tape setting	40Hz – 12kHz	average
Chrome tape setting	40Hz – 14kHz	good
Metal tape setting	40Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	100Hz – 12kHz	reasonable
Chrome tape setting	100Hz – 1.5kHz	excessive treble
Stereo separation	– 49dB	excellent
Distortion	3.5%	bass distortion
Noise, Dolby in:		
Ferric tape setting	– 61dB	high OVU level
Chrome tape setting	– 62dB	high OVU level
Metal tape setting	– 64dB	high OVU level
Speed variations	0.1%	above average
Speed accuracy	0.9% fast	poor

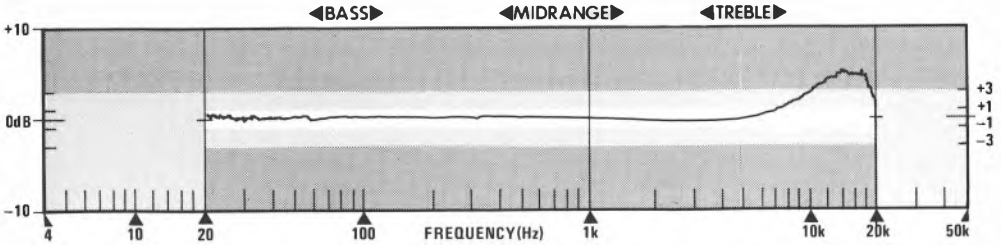
AMPLIFIER

Power output, per channel	91 watts	high power
Potential maximum volume with speakers supplied	106.5dB SPL	

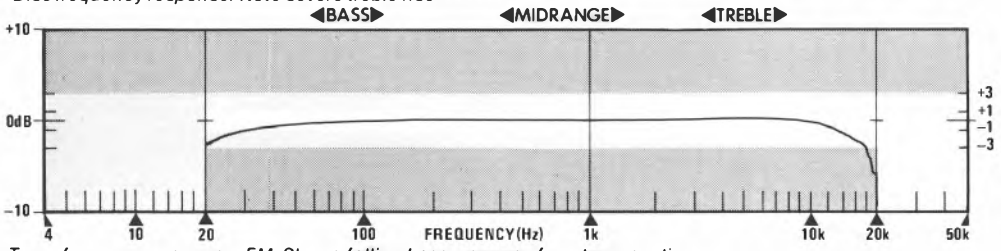
GENERAL

Rack dimensions	118cm x 51cm x 41cm
Speaker dimensions	60cm x 33cm x 33cm
Price	including speakers, £870

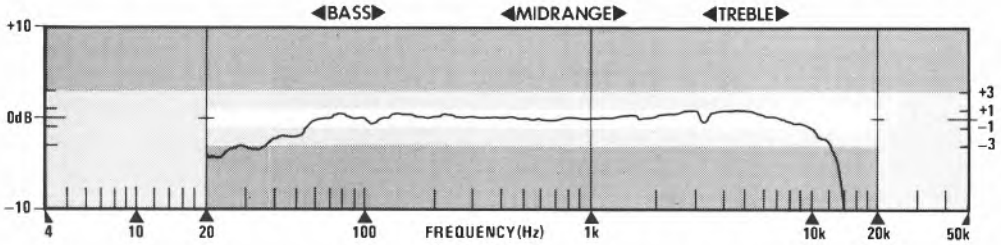




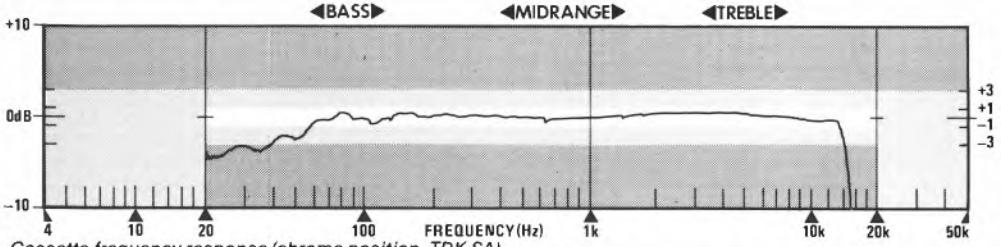
Disc frequency response. Note severe treble rise



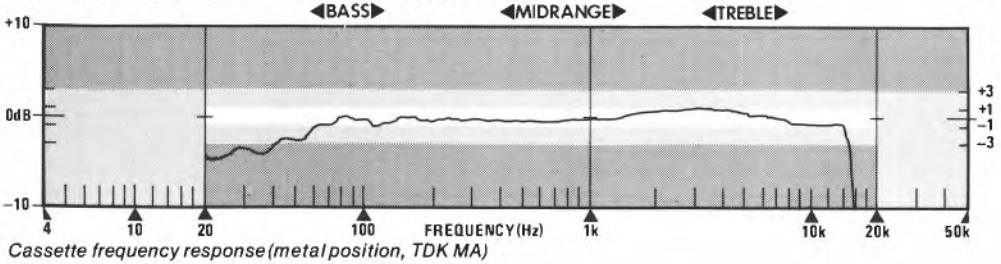
Tuner frequency response, FM. Shows falling bass response from tuner section



Cassette frequency response (ferric position, Maxell UDXL II)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

RECOMMENDED

Sanyo 3030

Sanyo Marubeni (UK) Ltd, Sanyo House, 8 Greycaine Road, Watford, Herts
Tel Watford 46363

Sanyo have long had a strong presence in the portable radio and music centre market and though they have produced separates hi-fi and related systems for a good while they never seem to have made quite the same market impact as other major Japanese manufacturers. The Sanyo 3030 rack comes in the middle of the rack systems market at £400.

The Sanyo rack was supplied made up and therefore no comments can be made on its assembly. The rack was sturdy because of the inclusion of a recessed chipboard back, through which access to the rear of the equipment was restricted to a wrist-sized porthole. The rack had a good quality finish, trim and door.

Disc

The Sanyo TP-X1S turntable was in some respects not up to the constructional quality of some similarly priced rack turntables. The pressed plate platter and very thin mat in particular were cause for concern. The deck's feet were softer than normally found on budget decks, but didn't prevent the deck from being susceptible to footfall feedback. The auto return arm was fitted with cartridge of Audio-Technica manufacture, having a moulded single-piece plastic cantilever instead of the usual aluminium tube.

Measurements on the TP-X1S revealed consistently above average results with the deck offering accurate speed with little drift – the cartridge gave good results from stereo separation low distortion and a reasonable frequency response trace, though from this there seem to be some arm resonance problems below 250Hz.

The JA-2003 amplifier produced no surprises and was well-engineered. The needle-type power meters, though, seemed pretty redundant with their slow attack and hence inability to indicate sudden peaks. The high filter acts well down into the treble region would therefore suit only bad tape noise or distant FM broadcast noise problems. Two pairs of speakers can be accommodated.

The Sanyo turntable and amp played through the reference speakers with the orchestral test piece produced a fairly good overall sound marred by a thin, nasal brass tone and a somewhat monophonic image. Rock sounded lightweight with a bright high frequency content to cymbals. Bass was rather confused – overall the sound was bland. The crossed-pair-miked chamber recording reproduced with a 'lost' and echoey image though the sound was well detailed, but flute and oboe sounded a bit whistly.

Tuner

The JT-2003LP tuner offers preset FM tuning, with screwdriver-set tuning capacitors beneath a small selector button and a crude bar indicator for tuned frequency. The tuning knob is backed by a free-moving flywheel which made manual tuning easy. The tuner measured well on the test bench except for poor distortion levels.

On broadcast speech in comparison with the reference tuner the Sanyo showed a slight edginess and a slightly increased noise level but was very close to the reference, confirming the flat frequency response. On symphonic music the tuner had a rather dry colouration on strings, but had a flat neutral sound – it could be that the tendency to sound less smooth than the reference was a manifestation of the distortion levels which showed up in measurement. Medium wave sounded slightly muffled and lacking treble extension in speech against the reference, but proved noise-free.

Cassette

The Sanyo RD2003 cassette deck may be up-to-date in that it has 'light-touch' transport controls but the manufacturer still sees fit to use mechanical pointer-type (moving coil) meters for record level setting, and does not provide a peak LED indicator. There is no Dolby indicator light nor illumination for the cassette compartment though the concentric knobs for left and right channel record level are ganged together enabling the user to execute clean fades. Phono plugs are provided on the ends of flying leads for connection to the system's amplifier.

Using TDK SA tape to record and then replay the orchestral test piece the Sanyo showed a slightly brassier balance than the source and lacked some weight in the cello and bass lines. The deck was considered though to give very good sound if a shade bland due to the lack of weight and impact. Rock music recorded on the Sanyo too suffered from a lack of punch and impact in kick drum, while vocals were slightly bright but with the very high frequencies were missing from cymbal crashes. Again, this was felt to be a good sound quality with none of the common cassette problems of image and pitch instability.

Pre-recorded cassette replay of the ferric test tape sounded rather forward with a loss of bass presence and a generally rising response. The chrome rock tape lacked weight in the bass guitar line though it was felt that the midband was good if forward.

Speakers

Sanyo's HF 3030 speakers are built in the UK, their cabinets being made up from one sheet of 12mm chipboard which is grooved and folded into a box shape. No panel damping is applied to these rather tall cabinets though the internal volume is damped by a handful of acoustic fibre. The two drivers are a 25mm shallow horn loaded doped cloth dome tweeter and a 180mm paper mid/bass driver with a chromed plastic trim – both units appearing to be of Scandinavian origin. A four element crossover integrates the drivers.

The in-room plot shows an evenly rolled-off bass (the 125Hz peak seems to be a room mode) and the midrange is even despite a small dip in the presence band. The tweeter shows a gentle rise out of the crossover region to peak at around 10kHz and then falls off sharply above.

On the reference system the HF 3030s were found to be a bit 'brassy' and a shade forward but in general, their quality put them in comparison with genuine hi-fi speakers rather than the more common 'shoebox with drive units' found supplied with some racks. The sound was detailed and open in the midband though bass began to double up and boom. Imagery was good. The rock track sounded a little 'zippy' in guitars and cymbals but the speakers could produce a clean unfatiguing sound – though the cabinets did boom a bit on the kick drum passages. The crossed pair chamber music recording showed that the speakers were capable of retrieving the acoustic information capture by this mike technique and while the clarinet and oboe were a shade hard the sound was felt to be good indeed considering the performance produced by other rack system boxes on this track.

The Sanyo turntable and amp were played through the Sanyo speakers for the next part of the test. The orchestral test piece had a deep image due to the presence suckout and though the top end was found fizzy the image was fairly stable with above average stereo separation and detail. Balance on the rock track was rather lacking at the top end while vocals lost presence. Bass was a trace boomy, but the sound was lightweight and cheerful though confusion set in when the music got louder. Piano suffered from a clangy high frequency

colouration. Though the sound was reasonably open the cartridge mistracked on this excerpt, and sounded lacking in weight and dynamic extension.

Summary

The Sanyo system provided no technological winner from among its components nor did any of the items sound exceptionally good. The great strength of the system lay in its consistent performance and the provision of a pair of decent speakers.

Recommendation is in order therefore considering the price, the consistent sound and the inclusion of a fair set of speakers offering high sound levels from the amp's available power. Pre-recorded tape replay was the only area in which the system fell below a good average.

SANYO 3030

DISC (performance via amplifier)

Frequency response	20Hz – 12kHz	above average
Stereo separation	– 24dB	above average
Distortion	0.33%	excellent
Hum and rumble	– 66dB	good
Hiss	– 76dB	good
Speed variations	0.1%	above average
Speed accuracy	0%	excellent
Tracking ability	16cms/sec	average

TUNER (performance via amplifier)

Frequency response	20Hz – 18kHz	very good
Stereo separation	– 37dB	very good
Distortion	2%	very poor
Minimum noise	– 69dB	average
Aerial signal for minimum noise	500uV	very good
Selectivity between stations	85dB	excellent
Sensitivity, mono	2uV	good
Sensitivity, stereo	25uV	above average

Signal strength meter levels (1) 3uV (2) 10uV (3) 40uV (4) 100uV (5) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

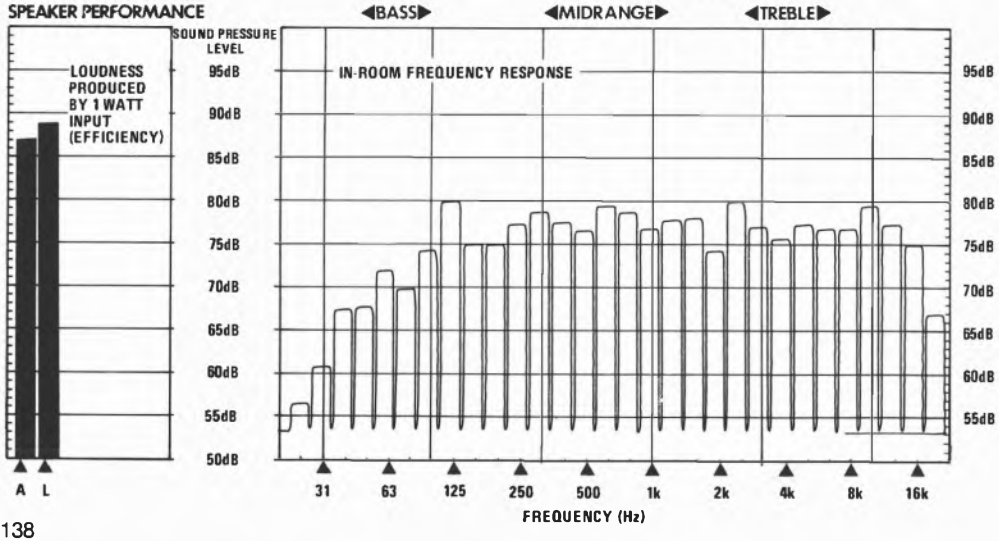
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	Scotch Metafine	
Frequency response, record/replay:		
Ferric tape setting	70Hz – 12kHz	average
Chrome tape setting	60Hz – 13kHz	average
Metal tape setting	65Hz – 14kHz	above average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	120Hz – 12.5kHz	weak bass
Chrome tape setting	120Hz – 12.5kHz	weak bass
Stereo separation	– 54dB	excellent
Distortion	1%	good
Noise, Dolby in:		
Ferric tape setting	– 58dB	good
Chrome tape setting	– 59dB	typical
Metal tape setting	– 61dB	typical
Speed variations	0.08%	good
Speed accuracy	0.2% slow	very good

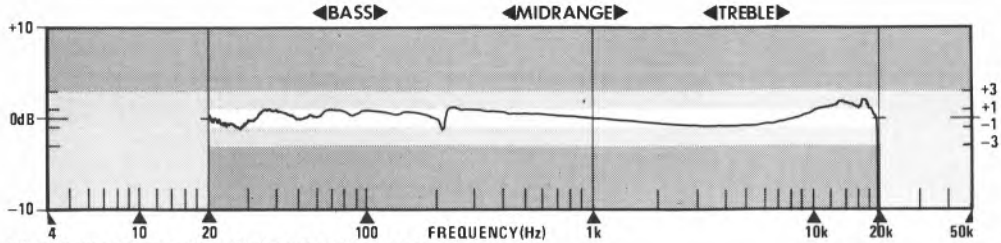
AMPLIFIER

Power output, per channel	36 watts	medium power
Potential maximum volume with speakers supplied	105.5dB SPL	

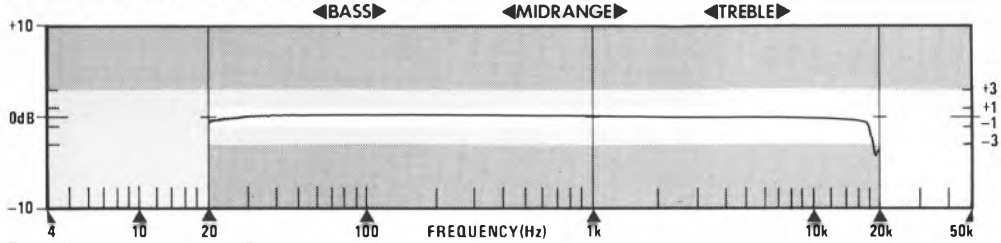
GENERAL

Rack dimensions	78cm x 46cm x 40cm
Speaker dimensions	60cm x 27cm x 24cm
Price	including speakers, £400

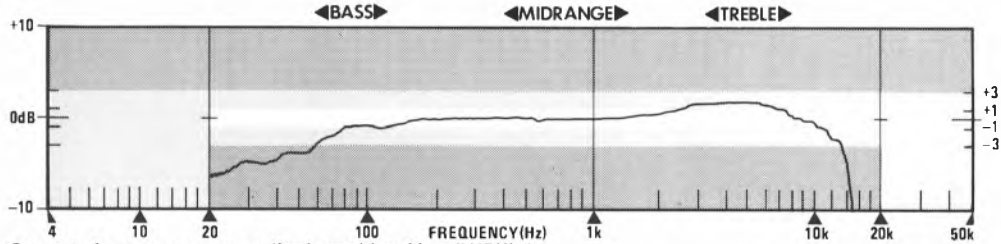




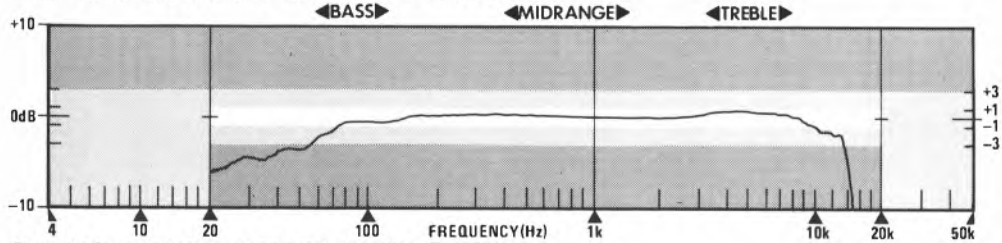
Disc frequency response. Quite a good response



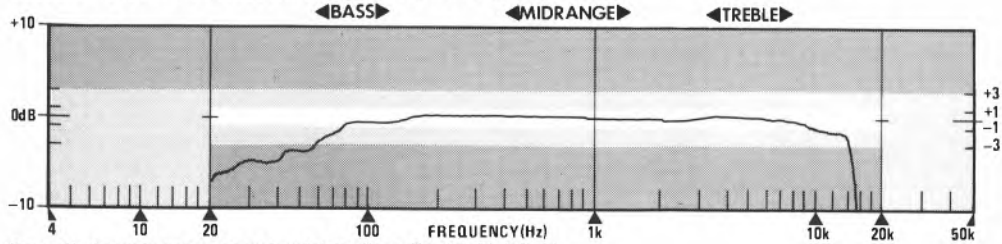
Tuner frequency response, FM. Very good flat response



Cassette frequency response (ferric position, Maxell UDXL i)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, Scotch Metafine)

Schneider 201

Schneider (UK) Ltd, 1-4 Dawson Road, Mount Farm Estate, Milton Keynes
Tel 0908 640970

Schneider equipment is designed and built in West Germany. Its styling and facilities line up suggests very much that this is equipment intended primarily for the European mainland market. The Team 201 System is supplied with a short castored rack finished in the distinctive metallic grey-brown paint of the equipment itself.

Packing for the Schneider rack was good and the instructions leaflet a clear step-by-step series of photographs. Assembly was easy as there were few components and much pre-assembly had been done for the customer. The rack benefited from a low centre of gravity though its light weight and large castors didn't help stability on a carpeted floor.

Disc

The Team 6014P turntable, as with the other Team 201 components, seems to have been designed to fit a wide rack – not the other way around. The plinth is a lightweight plastic moulding with power and speed change controls set in a sloping strip across the front of the deck. The space to the right of the pickup arm is used for a concealed compartment under an easily-overlooked flap – a 'Phonostatic' disc cleaner and brush are stored within.

Mounted in the plinth via rubber blocks, the turntable subchassis is an angle section of pressed steel on which motor with rubber mounts, bearing, platter and arm are carried. The straight arm is fitted with one of the new generation of inexpensive Audio-Technica made cartridges having a one part moulded plastic cantilever of near match-stick proportions.

The turntable lid is set on two friction hinges which need periodic tightening and are far less satisfactory than the now-common counter-balanced spring hinges.

The Team 202R receiver's amp section features electronic switching which fades between sources as they are selected. The characteristics of the balance and treble control seemed fair but the provision of a bass control seems wholly inappropriate in light of what we

were soon to find on test. Being of West German manufacture the Schneider equipment is fitted with DIN standard socketry throughout though the tape sockets seem to be at the more common Japanese phono socket standard for impedance and sensitivity which ensures compatibility with the majority of cassette players on the market.

The surprise awaiting our pen recorder was the bass boost, which is designed into the Schneider amplifier. There is a massive 10dB boost at around 40Hz with the volume control one third advanced, though this drops to 8dB with the volume half on. Through the Schneider 202R, the cartridge seemed incapable of producing any section of flat response as after the great bass boost the response fell through the midband to 6kHz where it started to rise to a high frequency peak of +2dB at 14kHz. The cartridge turned in low distortion figures however and tracked well.

On audition the turntable seemed very sensitive to footfall feedback and produced a reedy string tone with thundering bass and edgy high frequencies on the orchestral test disc. The sound seemed ideally suited to attract attention in an open showroom in competition with other systems – in domestic surroundings it was fatiguing.

Rock music showed a fairly good midband, but the hyped boom in the bass and peaky top spoiled this quality. On the classical chamber music piece recorded with crossed pair mikes the turntable's wowing became very audible on flute – investigation of the cause showed the platter to be warped and off centre which also explains the poor speed variation figure. Rumble and low frequency noise was very obtrusive in the quiet chamber work.

Receiver

The Team 202R tuner section, remarkably, had no interstation muting and a manually switched AFC. The tuning knob was very stiff. The FM presets required setting with a screwdriver. An absurb five segment indicator covered the 88MHz to 108MHz band for the presets. The signal strength meter proved far too sensitive, lighting all five LEDs for a signal less than one tenth that required for minimum noise performance!

Both the reference tuner signal fed through the tape inputs and the tuner were treated to the Schneider bass lift which made comparative listening more difficult than usual though on broadcast speech it seemed that the tuner of the 202R was more boomy in male voice. Classical orchestral music was confused in the midband yet flat in the treble. Medium wave was very dull and muffled but noise free.

Cassette

The Team 6014C cassette deck is almost value for money on sheer size! There is a lot of empty space inside, as with many rack-system units. This deck however seemed a competent performer though the 16dB dynamic range of the meters was a little restrictive. Of course as we were measuring all sources through the system's amp, this saddled the 6104C's response traces with a large bass lift – but that's what you'd hear using it through the Schneider receiver.

Using TDK SA-X tape the orchestral test piece was recorded and played back for comparison with the source. The sound was quite good except for a rich midband colouration and booming bass quality. The rock track was slightly forward but considered a fair sound though there was a total lack of bass control.

Pre-recorded tape replay with the ferric test piece revealed a wiry sound in strings with lots of tape noise and ill-defined bass. The rock tape on chrome EQ sounded very dull in cymbal crashes while vocals were muffled and thick with a forward quality. Bass was badly uncontrolled.

Speakers

The Schneider 27.1LS speakers are smartly finished with foam grilles (glued in) and metallic paint finish to match the rack. They are 4ohm speakers with three drive units which also proved to be glued onto the baffle preventing inspection of the cabinet and crossover. The units comprise a 40mm paper tweeter, a 60mm midrange unit and a 140mm paper bass driver. Flying leads terminating in DIN speaker plugs were fitted.

The in-room plot shows a peaky uneven response yet the auditioning notes suggest a smooth dull sounding speaker rather veiled in quality particularly on orchestral music. The rock guitar had a nasal colouration with the whole band apparently set in a hollow echoey acoustic. Bass transients seemed to be too much for the speaker and boomily dominated the sound. Voice was quacky and edgy. The string quartet suffered from a nasal, squeaky colouration which was unacceptable for this type of music. The crossed-pair-miked chamber music had a diffuse image with a very forward balance lacking detail and a sense of the recorded ambience. Woodwinds were 'peepy' and edgy.

The Schneider disc system with the 27.1 LS speakers produced a very artificial sound with orchestral music. Bass was over rich and resonant and treble shrill. Dynamic range seemed limited and the orchestral stereo image was very 'laid back' no doubt due to the droop in the presence band. Rock music had a soggy

overblown bass quality though vocals were quite fair. Cymbals were 'splatty'. Piano music showed up the bad speed drift of the turntable again while the instrument had a leaden tone and no dynamic contrast.

Summary

The bass lift applied to the amplifier is an immediate bar to any recommendation. Not only was the amp underpowered for the relatively efficient KEFs but the bass lift is asking too much of it. With speakers other than the Schneiders which had limited bass output anyway and were sensitive 4ohm designs the Team 202R receiver could prove to be a speaker-buster.

The disc section was fitted with a fair arm though the platter and subchassis seemed insubstantial and badly put together. The tuner and cassette deck didn't reveal their potential behind the amp's excessive bass output.

Pre-recorded cassette replay on the Schneider Team 6014C produced such a bad quoted response because the tape manufacturer chooses to put his 0dB level at 333Hz rather than 1kHz – if the latter were the case then the same curve could be interpreted as giving a 300Hz to 10kHz response. When 0dB is set at Dolby level manufacturers gain a 3dB noise advantage but peak distortion figures go up in a direct trade off.

The speakers were three-way designs, although this would never be obvious in the shops as the grilles were fixed. Better speakers results could be built less expensively with two units.

The Team 201 system exhibited no particular strengths and seems very uncompetitive at the quoted price.

SCHNEIDER 201

DISC (performance via amplifier)

Frequency response	500Hz – 12kHz	excessive bass
Stereo separation	– 23dB	average
Distortion	0.5%	very good
Hum and rumble	– 63dB	below average
Hiss	– 76dB	good
Speed variations	0.2%	very poor
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	500Hz – 18kHz	excessive bass
Stereo separation	– 38dB	very good
Distortion	0.3%	above average
Minimum noise	– 69dB	average
Aerial signal for minimum noise	500uV	good
Selectivity between stations	72dB	good
Sensitivity, mono	4uV	poor
Sensitivity, stereo	25uV	good

Signal strength meter levels (1) 4uV (2) 6uV (3) 10uV (4) 25uV (5) 40uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

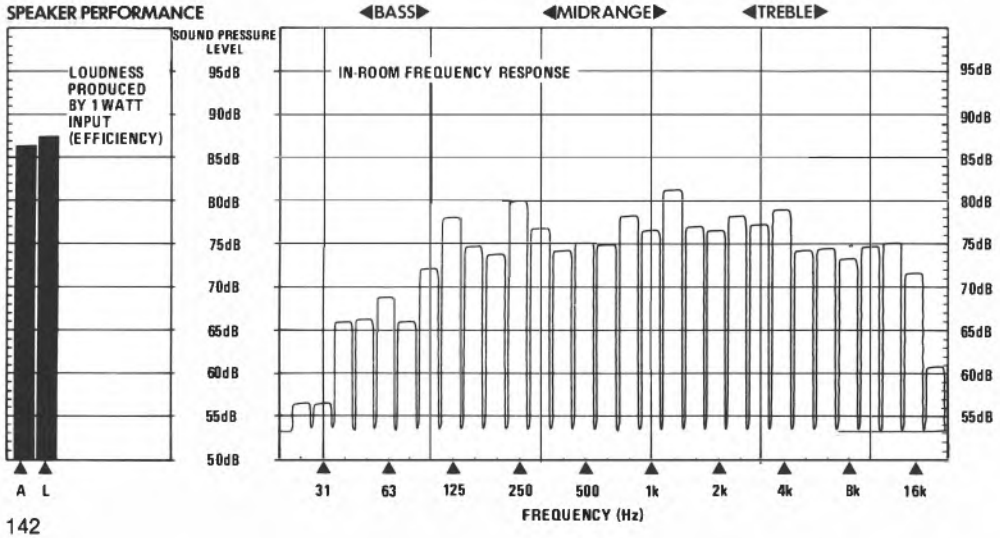
Ferric or Normal tape setting	TDK AD	
Chrome tape setting	TDK SA-X	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	400Hz – 15kHz	excessive bass
Chrome tape setting	300Hz – 15kHz	excessive bass
Metal tape setting	350Hz – 14kHz	excessive bass
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	200Hz – 1kHz	excessive bass
Chrome tape setting	200Hz – 4kHz	excessive bass
Stereo separation	– 49dB	excellent
Distortion	0.8%	good
Noise, Dolby in:		
Ferric tape setting	– 59dB	good
Chrome tape setting	– 61dB	good
Metal tape setting	– 58dB	typical
Speed variations	0.12%	average
Speed accuracy	0.7% fast	poor

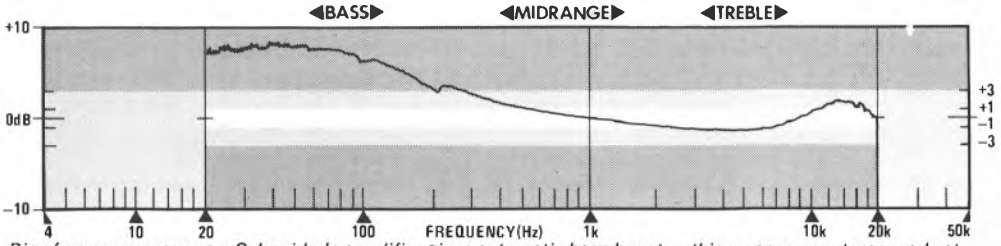
AMPLIFIER

Power output, per channel	25 watts	low power
Potential maximum volume with speakers supplied	103dB SPL	

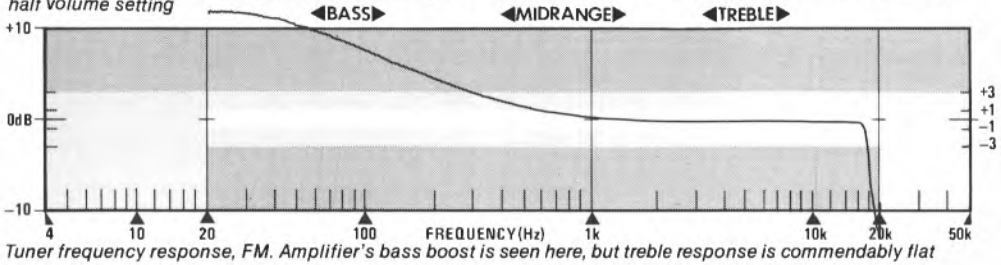
GENERAL

Rack dimensions	57cm x 75cm x 40cm
Speaker dimensions	41cm x 25cm x 18cm
Price	including speakers, £419

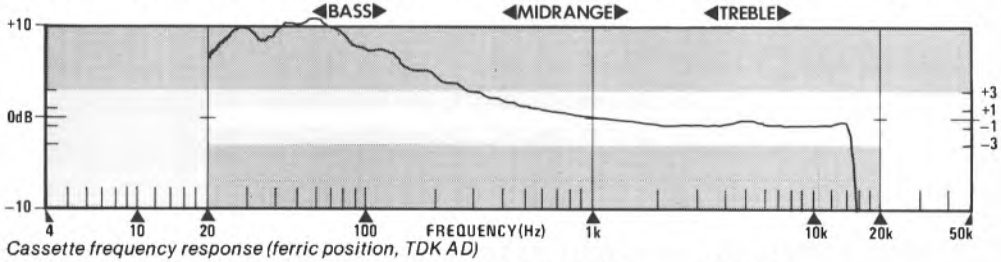




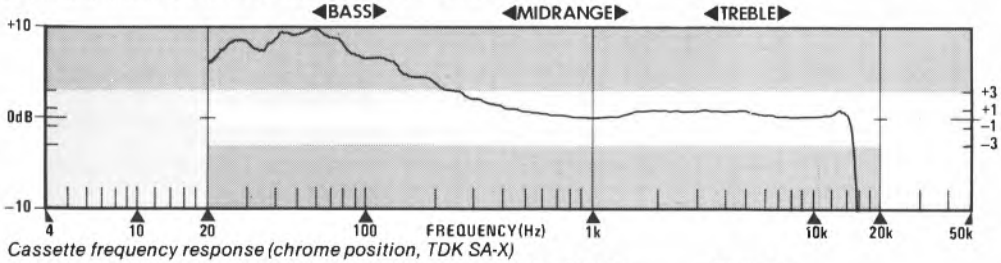
Disc frequency response. Schneider's amplifier gives automatic bass boost – this measurement was made at half volume setting



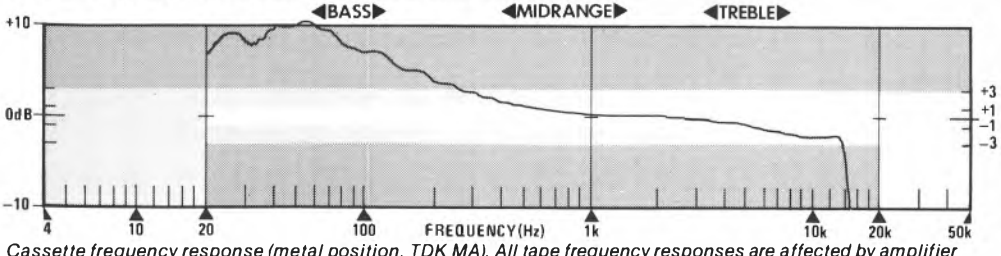
Tuner frequency response, FM. Amplifier's bass boost is seen here, but treble response is commendably flat



Cassette frequency response (ferric position, TDK AD)



Cassette frequency response (chrome position, TDK SA-X)



Cassette frequency response (metal position, TDK MA). All tape frequency responses are affected by amplifier bass boost on replay

Sony ZR1

Sony (UK) Ltd, Pyrene House, Sunbury Crescent, Sunbury-on-Thames, Middlesex TW16 7AT
Tel Sunbury 87644

To produce a less expensive system than their popular Z1, Sony have replaced its separate amplifier and tuner with the STR-VX2L receiver to create the ZR1 system. We tried out both systems initially, and decided to concentrate on the ZR1 as offering potentially better value.

Remarkably, the relatively inexpensive ZR1 shares a rack not only with the Z1 but with the up-market remote control S80 system. The Sony SU-L27 audio rack is available in a range of finishes – ours were supplied with walnut vinyl and black vinyl. Details of this rack can be found in the S80 review but it was felt that while the rack had its weight to help stabilise it and isolate the turntable from the environment the fitted castors did not help.

Disc

The PS-LX2 turntable is a direct drive servo locked design fitted with a low mass straight arm and featuring auto return only. Once the platter has come up to speed the servo lock indicator lights. No pitch control is provided. Sony's XL-150 cartridge tracked very well at 1.8 grams in the Sony pattern headshell, which by the way is not interchangeable with headshells other than Sony spares. Unfortunately the cartridge did not measure well in other directions, achieving only poor results on the frequency response trace with average separation and distortion figures. Additionally, the cartridge proved hum-sensitive on the test bench though no problems were encountered with the cartridge being above the receiver.

The turntable's speed was very stable though it ran marginally slow. But it proved very prone to feedback and this coloured its performance.

The STR-VX2L receiver is fitted with IEC type power outlets to which the other units in the ZR1 system can be connected – which avoids the need for a row of 13 amp sockets. The function switches with indicators are placed on the right of the receiver, over the large volume control. The VX2L will accept signals from a tape deck (rec/play), a disc source and one auxiliary input. The tone controls and loudness switch offered

the typical plus or minus 8dB range of cut or boost at 100Hz and 10kHz found on almost every Japanese amp. Two pairs of speakers can be accommodated, driven separately or together.

The disc system through the reference speakers showed a muddled bass quality in orchestral music which was probably due to the bad turntable isolation. The cartridge tracked this music well producing a good image but string tone was very thin and bright with no real treble extension. Rock music sounded distant with a 'spitty' treble and bass guitar was surprisingly lightweight despite the disc system's 'bottoms up' frequency balance. Nevertheless the midband sounded quite detailed with the multi-tracked backing vocals being quite clear. The chamber music excerpt recorded with crossed-pair mikes had an artificially deep image due to the dip in the presence band. Horn was muffled and the wind instruments had no bloom or overtone structure. Separation was quite good and the image stable.

Receiver

The tuner section of the VX2L receiver suffered from its tuning scale being cramped into the half-width window to the left of the fascia. The small tuning knob and band selector are placed underneath the scale. The signal strength meter and 'acute servo lock' ensured quick, accurate tuning and guaranteed identical distortion results on all stations. The measured distortion though was well above spec at 0.5% while a second sample measured over 1% – though out of spec this is still an average result. On broadcast speech the tuner section sounded croaky and bright lacking the weight of the reference. On choral music with organ the VX2L did not reproduce the church acoustic too well and lacked the bass extension of the reference tuner. Sound quality was still considered good. On medium wave the VX2L did far less well with very indistinct reception of speech and a scrawny boxy colouration.

Cassette

Sony's TC-FX2 cassette deck is neatly styled with a full depth cassette compartment though this did not have a light. Slow-acting needle meters are fitted for record level, though the peak level LED indicator helps you keep within the tape headroom. The large cassette compartment door comes away for access.

Using Sony's own CD Alpha tape the orchestral test piece was recorded and replayed against the source. There was a fair bit of hiss noticed on replay with some confusion in heavily modulated passages while the whole sound lacked presence. The rock track exhibited an upper bass hump while kick drum sounded wooden and treble dry and hollow. Though bass overhang was noted the sound quality was considered fairly good overall.

A second sample of the TX-FX2 cassette deck (which had been supplied to us with the Sony Z1 system) was also measured as a check. The differences in replay response between these two machines was quite alarming and not a particularly good advert for tight quality control. The published results relate to the better of the two decks. In view of this it might be wise to audition the FX2 you intend to buy in the shop before purchase.

On pre-recorded tapes the FX2 showed a presence droop while lower strings in the ferric test were quite woolly. Flutes and strings seemed 'fluffy' while the image was rather 'phasey'. Chrome tape replay showed a dry mid and treble quality with some looseness in bass though the overall sound was quite fair.

Speakers

Sony's SS-E34 speakers are assembled in West Germany though the drivers appear to be shipped in from Japan already mounted on the baffle. The 65mm paper cone tweeter is crossed over at 7kHz to a 160mm paper mid/bass unit reflex loaded by a 50mm diameter plastic port and tunnel let through the baffle. The grilles are stretched over frames which are extremely deep and will affect the treble dispersion and imaging properties of the speakers. The SS-E34s are quite sensitive and will produce high levels.

The in-room plot shows a balance which is strong in the upper bass with a treble peak and this was readily detected on the orchestral test piece. Lateral positioning of stereo images was quite fair but the sound was very forward due to the frequency balance – strings had a papery dry edge to their sound. Rock music was very coloured, with a pumping one-note bass, while cymbals were rattly and guitar wiry. Surface noise intruded on the string quartet disc while the string tone vilely coloured – I would describe it as 'stringy' in the perjorative sense. The SS-E34s seemed to miss the point of the crossed-pair chamber recording as they produced no sense of image depth. Flute was 'fat' and missed its treble extension, while mid tones were very resonant and coloured.

Using the SS-E34s with Sony's disc front end and receiver produced a better sound than with the reference disc system and there seems to have been some matching of the tone qualities of the components. The orchestral sound was still dull in the treble with a fizzy high frequency while mid tones were diffuse and cloudy. Bass 'grumbled', but was not as dominant as with the reference disc system.

Rock music has a distinctive 'jukebox' quality

being very forward, sibilant in the treble with an underpinning of loose boomy bass. The sound was very fatiguing with the stereo image being disturbed and 'phasey' – the centre image was pushed far forwards. Piano was similarly dominated by a hollow booming bass quality though the sound was very 'present' and on top of the listener.

Summary

Again it is surprising to report that auditioning the receiver only in the reference system showed its amplifier section to sound humpy in the upper bass region, to be veiled in the midband and to have a gently rolled off treble quality.

The tuner section of the receiver measured out of specification on distortion though there were no audible problems were encountered – indeed the tuner section in other respects measured well and its frequency response trace shows none of the tonal imbalance alluded to above. By going for the Z1 system you would get a better tuner, but the audible benefits would be negligible in the context of the rest of the system.

The TC-FX2 deck proved best suited to the replay of pre-recorded cassettes and could sound very good with well-produced musicassettes. A second sample brought into question the alignment consistency of this model.

The disc section performance was limited by the coloured response of the XL-150 cartridge though in all other ways it performed well.

The SS-E34 speakers may create high levels but were unacceptably coloured except perhaps for limited-dynamic-range MOR material. The ZR1 system does not compete at this price.

SONY ZR1

DISC (performance via amplifier)

Frequency response	200Hz – 3kHz	very poor
Stereo separation	– 20dB	average
Distortion	1.3%	average
Hum and rumble	– 65dB	average
Hiss	– 74dB	average
Speed variations	0.05%	excellent
Speed accuracy	0.3% slow	average
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	25Hz – 18kHz	very good
Stereo separation	– 47dB	very good
Distortion	0.5%	average
Minimum noise	– 73dB	very good
Aerial signal for minimum noise	1mV	average
Selectivity between stations	66dB	average
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	32uV	below average

Signal strength meter levels (1) 1.2uV (2) 3uV (3) 20uV (4) 50uV (5) 100uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

Ferric or Normal tape setting	Sony BHF
Chrome tape setting	Sony CD
Metal tape setting	Sony Metallic

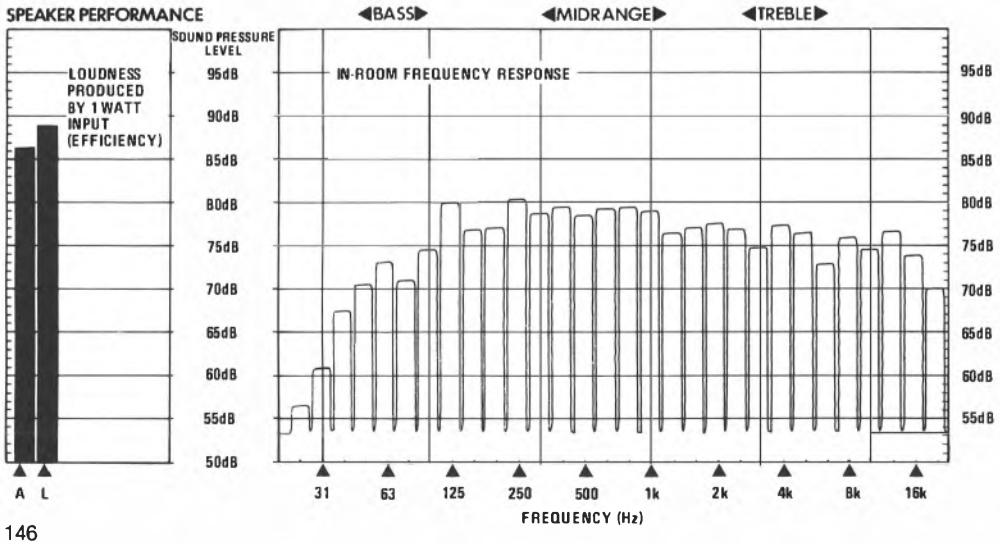
Frequency response, record/replay:		
Ferric tape setting	22Hz – 11kHz	average
Chrome tape setting	22Hz – 12kHz	average
Metal tape setting	22Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 12.5kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 43dB	very good
Distortion	0.9%	good
Noise, Dolby in:		
Ferric tape setting	– 54dB	poor
Chrome tape setting	– 57dB	poor
Metal tape setting	– 57dB	below average
Speed variations	0.06%	very good
Speed accuracy	0.3% fast	average

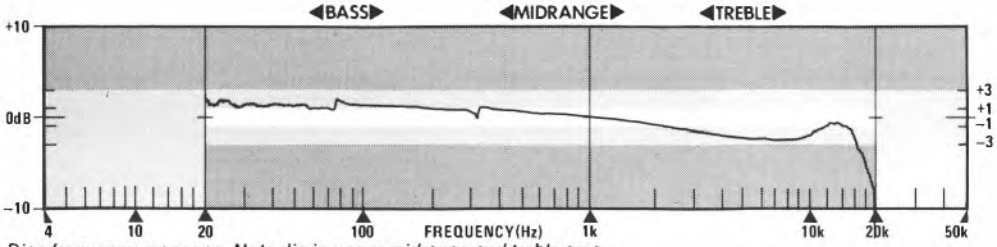
AMPLIFIER

Power output, per channel	40 watts	medium power
Potential maximum volume with speakers supplied	105.5dB SPL	

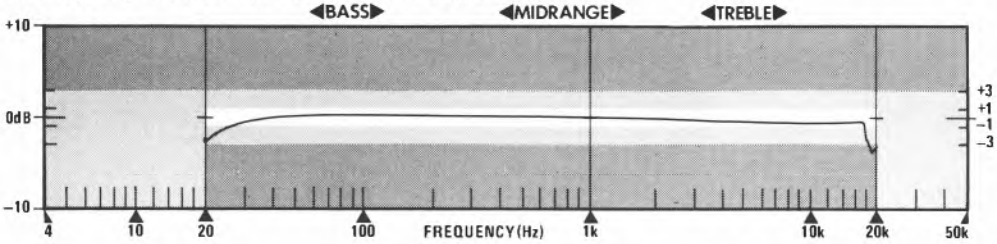
GENERAL

Rack dimensions	86cm x 48cm x 41cm
Speaker dimensions	48cm x 25cm x 24cm
Price	including speakers, £369

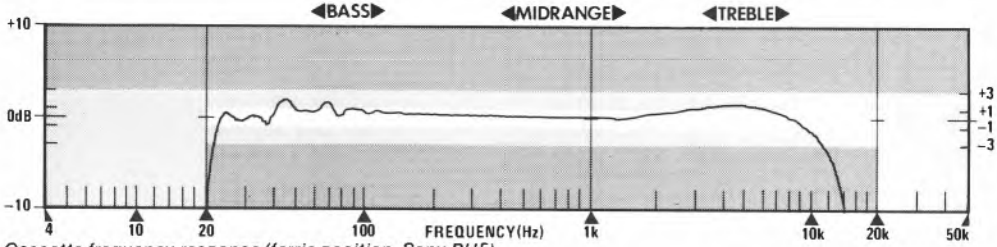




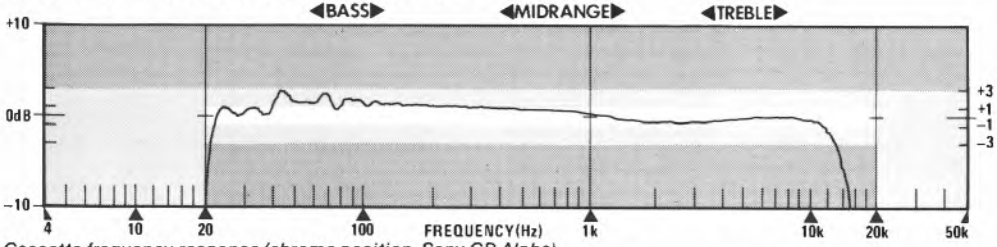
Disc frequency response. Note dip in upper midrange and treble area



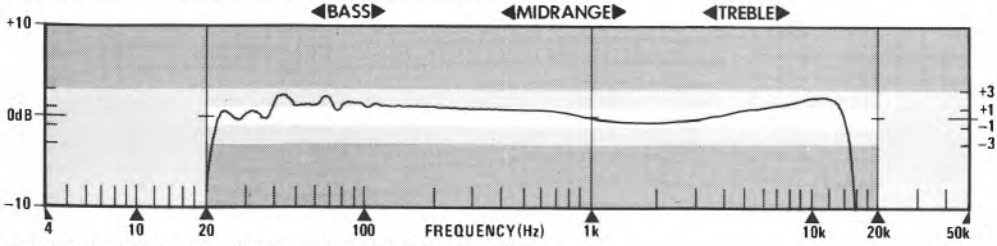
Tuner frequency response, FM. Good response from receiver's tuner section



Cassette frequency response (ferric position, Sony BHF)



Cassette frequency response (chrome position, Sony CD Alpha)



Cassette frequency response (metal position, Sony Metallic)

Sony 80

Sony (UK) Ltd, Pyrene House, Sunbury Crescent, Sunbury-on-Thames, Middlesex TW16 7AT
Tel Sunbury 87644

Sony's S80 is a rather unusual up-market remote control system, in that it is based on a high power receiver. Though a range of racks – including Queen Anne reproduction cabinets – is available the SU-L27 rack supplied with this system is a conventionally styled tall rack with glass lid. This very heavy rack comes well packed with its parts numbered and a clear instruction leaflet. Assembly was simple but the rack seemed 'over engineered' with fancy fasteners and a Velcro applied back panel.

Disc

Sony's PS-LX5 direct drive turntable is not only fully automatic but has record-size sensing too, with a light source in the pillar to the back right of the turntable shining through prisms to a detector beneath the mat. Being a fully auto model the LX5 has a repeat play facility.

A Sony XL-200 cartridge is fitted to the vestigial headshell on the straight wand type arm, and though this cartridge tracked well at 1.5 gram and had a good stereo separation it produced poor distortion results and an uneven frequency response, being down in the treble above 3kHz with a high frequency peak. The bottom end roll-off shown in the frequency response plot is due to the amplifier. The turntable turned in excellent measured performance and was well isolated.

One problem facing the user who wishes to change the cartridge with this model is that the headshell is an exclusive Sony design.

The amplifier section of the STR-S5L receiver features a motor-driven volume control with a linear scale in addition to the power meters. The rather flimsy drop down cover on the front of the receiver reveals the balance, tone and 'sound enhancer' controls. With the 'Manual' switch depressed the receiver's tone controls operate as normal offering a traditional 8dB cut or boost at 100Hz and 10kHz. The sound enhancer is merely a glorified loudness control with fixed boosts of 8dB at 80Hz, 6dB at 800Hz in the midband and 8dB at 8kHz in the treble. These boosts can be selected all three together, bass

and top together or bass only; their operation is indicated by a red LED above each button which shines through the front panel even when closed. These controls proved of little use except at low levels when a conventional loudness button would almost do just as well. The balance control was rather rapid acting near the extremes of rotation. Unusually, the receiver features a ¼ inch jack auxiliary input.

Using the Sony turntable and receiver through the reference speakers on the orchestral test piece produced a thin sound lacking body and although the cartridge tracked extremely well the sound was at times shrill and edgy. Image depth was affected by the dip through the presence band while massed brass could sound very harsh.

The rock track sounded very bland and undynamic with this equipment while the electric bass line was humped up in the upper bass region. Male voice was pushed forward in the mix and yet the singer's diction was not easy to catch. The crossed-pair-miked chamber music showed good lateral separation though the image depth was distorted by the frequency balance. The disc system gave a mid-prominent sound lacking power and presence.

Receiver

The tuner section of the S5 receiver measured well though the bass roll-off seen on the disc trace was here again. The S5 offers seven preset stations each on FM and AM though an infinitely variable manual overide button allows tuning for weak signals which are not picked up by the auto scan. This facility for infinitely variable tuning is unusual on a digitally synthesised tuner which would normally step in discrete 50kHz steps as indeed the S5 does on auto. The station names can be inserted into a grid through the top of the fascia.

On broadcast speech the Sony lacked the weight in chest tones and sounded lighter and brighter than the reference. The Sony also sounded brighter and fizzy on music, with an edgy treble in string tone. Medium wave proved noisier than the reference with less treble extension and consequent impairment of clarity.

Cassette

Sony's TC-FX6 cassette player borrows from the most up-to-date video recorders an indispensible feature – the real-time tape counter which shows you tape used in minutes and seconds. You need never again wonder if you can squeeze a 2 minute 57 second track onto the end of a tape with the FX6, as spooling through the remaining tape will tell you exactly how much time you have left. The FX6 additionally has fully programmable memory, play and repeat facilities as well as Automatic Music Sensing. For instance the machine can be programmed to look for a specific section on the tape and can then repeat play that section.

The cassette compartment offered excellent head access for cleaning while there was the nicety of a level control on the headphone output and good sliders for record level.

Using Sony's own CD Alpha tape the FX6 was compared to the source signal in the record/replay test when on orchestral music it gave a fairly good sound, though with thickened brass tones a lack of top end 'air' and an image that was felt to be crude and forward. The rock track suffered from a soggy bass quality and early roll-off – there was no impact in the kick drum passage either. On pre-recorded ferric tape replay the FX6 lacked the bottom-end detail of the reference machine and sounded a touch shrill in the treble though imagery was wide and stable. The rock chrome tape sounded clear but lacked weight and seemed to be gradually rolled-off in the treble.

Speakers

The SS E50/II speakers are built in West Germany and incorporate a 19mm soft dome tweeter, a sealed back 80mm paper midrange unit and a 200mm paper woofer in a chipboard cabinet with fibre pads for panel damping. The plastic grille frame is rather deep though helps to disguise the speakers' size. The SS E50s were auditioned back to the wall as recommended by Sony though our in-room measurements showed that this merely emphasises the 250Hz suckout and humps up the bass above 60Hz. Listening tests in the back-to-the wall position with the reference system showed a very boomy upper bass as expected in the orchestral piece. The presence band was hollow and sucked out distorting the image depth while string tone sounded edgy. In the rock excerpt bass guitar predominated while the kick drum sounded boxy and cardboardy though the sound was in context considered fair. The violins in the string quartet were thickly coloured with their harmonic structure suppressed by the speakers though the image was stable and fair. The crossed-pair-miked chamber piece showed an artificial image depth due to the balance. Flutes lacked overtones though the horn and oboe playing together could sound very edgy.

The complete Sony disc system was then auditioned when it seemed flatter and less grumbly in the low bass with the same orchestral test piece. This could be due to the receiver's bass roll-off noted earlier. Treble was found peaky and mid string tones muffled. Rock showed a very fatiguing midband forward balance with sibilant whistly vocals while

electric bass boomed. Piano sounded badly integrated with a clangy treble and boomy bottom end.

Remote

The RM-S5 infra-red remote control supplied with the Sony unit is connected via multi-strand flat cable to the receiver, cassette deck and turntable. It also provides remote power sockets into which each item of the S80 system can be neatly plugged.

The hand controller offers mains power on/off, record start/stop, volume control, preset selection and cassette transport control.

Summary

Some of the explanation behind the mediocre listening test results of the S80 system must be the amplifier's bass roll-off. This system is capable of producing high sound pressure levels due to the 78 watt output of the receiver and the high sensitivity of the E50 speakers. The sound quality of the speakers can only be said to be fair and then not with them positioned as Sony suggest back to the wall.

With such a welter of facilities it becomes difficult to decide which are mere gimmicks and which are of lasting use.

The amplifier's sound enhancement controls proved to be another new name for an old device while the volume range scale seemed somewhat redundant. Better sound quality can be obtained elsewhere at less cost – unless the glare of Sony's undeniably attractive styling, and extensive facilities, blinds you to other equipment.

SONY S80

DISC (performance via amplifier)

Frequency response	20Hz – 4kHz	poor
Stereo separation	– 32dB	very good
Distortion	2%	poor
Hum and rumble	– 66dB	good
Hiss	– 76dB	good
Speed variations	0.06%	very good
Speed accuracy	0.1% fast	excellent
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	40Hz – 16kHz	good
Stereo separation	– 50dB	excellent
Distortion	0.2%	good
Minimum noise	– 72dB	very good
Aerial signal for minimum noise	630uV	good
Selectivity between stations	70dB	good
Sensitivity, mono	2uV	good
Sensitivity, stereo	25uV	above average

Signal strength meter levels (1) 2.5uV (2) 16uV (3) 40uV (4) 160uV (5) 630uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

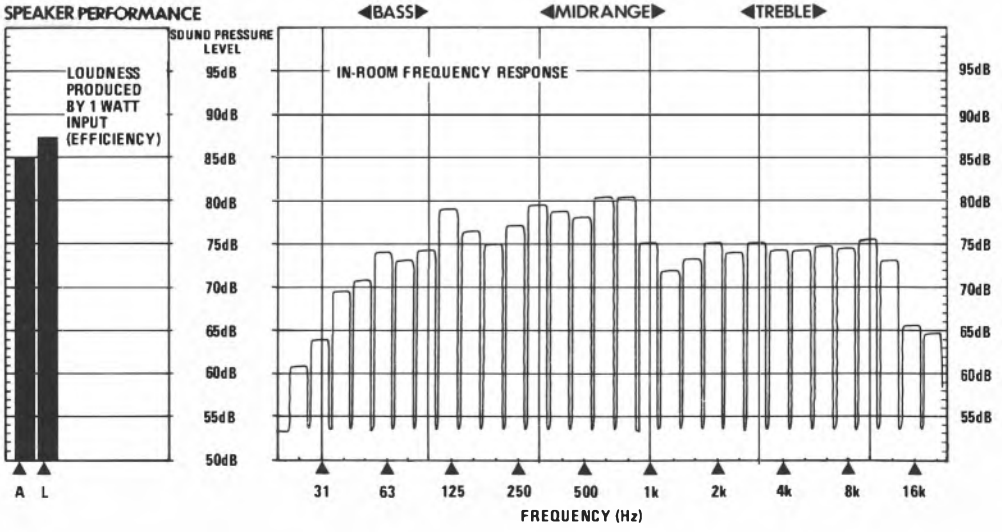
Ferric or Normal tape setting	Sony AHF	
Chrome tape setting	Sony CD	
Metal tape setting	Sony Metallic	
Frequency response, record/replay:		
Ferric tape setting	34Hz – 12kHz	average
Chrome tape setting	34Hz – 14kHz	above average
Metal tape setting	34Hz – 15kHz	very good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	60Hz – 12.5kHz	excellent
Chrome tape setting	60Hz – 12.5kHz	excellent
Stereo separation	– 51dB	excellent
Distortion	2%	below average
Noise, Dolby in:		
Ferric tape setting	– 56dB	below average
Chrome tape setting	– 58dB	below average
Metal tape setting	– 57dB	below average
Speed variations	0.05%	excellent
Speed accuracy	0.2% fast	very good

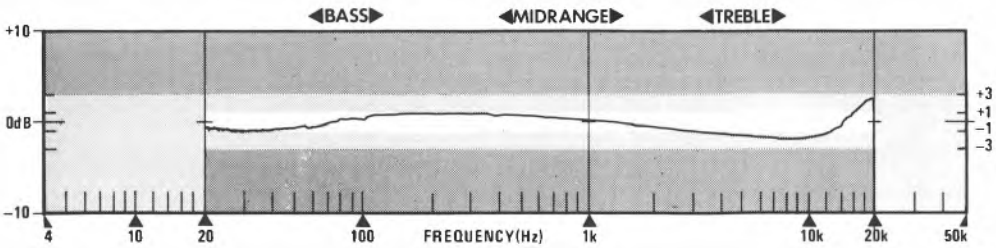
AMPLIFIER

Power output, per channel	78 watts	high power
Potential maximum volume with speakers supplied	107dB SPL	

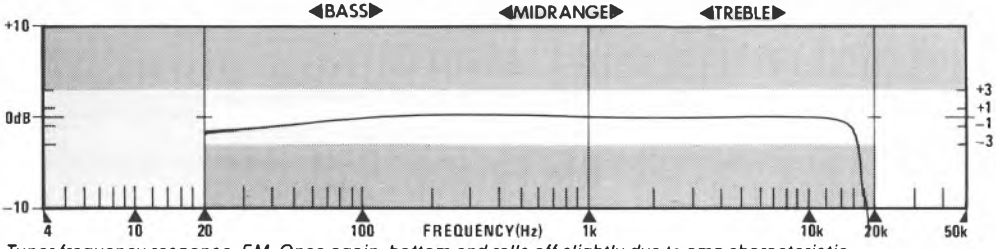
GENERAL

Rack dimensions	86cm x 48cm x 41cm
Speaker dimensions	57cm x 28cm x 27cm
Price	including speakers, £789

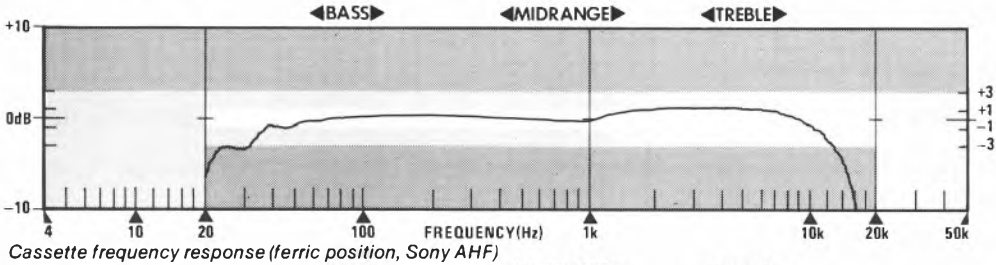




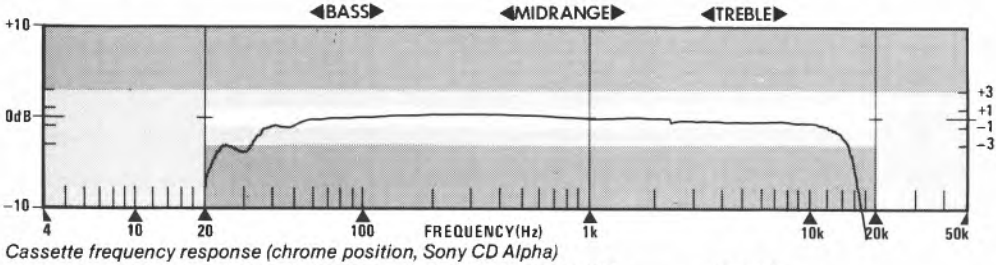
Disc frequency response. Bottom end roll off is due to amplifier section characteristic



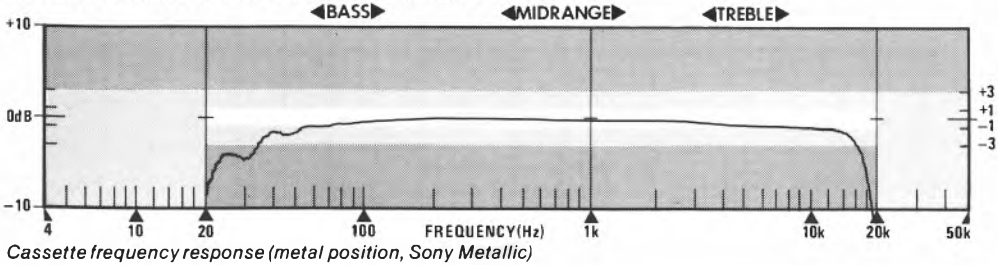
Tuner frequency response, FM. Once again, bottom end rolls off slightly due to amp characteristic



Cassette frequency response (ferric position, Sony AHF)



Cassette frequency response (chrome position, Sony CD Alpha)



Cassette frequency response (metal position, Sony Metallic)

RECOMMENDED

Teac Ace 7D

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

Teac's garishly colourful equipment fits in a rack which matches the S7 speakers. The system can be supplied with three identical chrome tubular stands for the two speakers and equipment rack. The L9 audio rack is well packed in a double walled carton and no assembly is required. The paint finish matches the grey of the speaker cabinets and the plastics trim matches the equipment though care must be taken when the equipment is installed in the L9 rack to ensure all is squared up and secure.

The L9S tubular stands require little assembly and need only ten screws apiece. The stability of these stands though is not good.

Disc

The Teac P7 record deck is a fully automatic direct drive model with a straight tonearm of low mass which comes without a fitted cartridge. Our measurements and listening tests were carried out with an Ortofon FF15E MkII cartridge fitted. The P7 proved solidly built with fair suspension. All controls are on the deck's sloping front and, while auto-cue is provided, the arm can also be used manually.

Though a strobe pattern and light are provided for the turntable the speed is set by reference to a quartz crystal which ensured perfect speed accuracy. Noise from the P7 was very low too and the Ortofon cartridge tracked well.

The A7 amplifier is finished in the distinctive beige and orange colours that Teac use for their 'Ace' equipment range though the amp has useful features and is not merely 'flashy'. Two sets of speakers can be driven and a switchable input for either moving coil or magnetic cartridges is a useful addition. The source selector and record selector panel is well laid out, the top row of buttons and LEDs showing which source – disc, tape 1, tape 2, tuner or auxiliary – has been chosen to be monitored through the system while another set of buttons below can independently route signals from any of these sources to the tape outputs.

Tone controls are to the right of the concentric volume and balance controls above the mic

mixing facility. Usefully the typical plus or minus 10dB cut/boost (at 100Hz and 10kHz) tone controls can be bypassed by a tone defeat button. A good subsonic filter is provided offering a steep 18dB per octave slope below 25Hz. The power meters are absurdly sensitive and seem to be provided more for illumination than edification!

The orchestral test piece showed the amp and turntable to be capable of a wide dynamic range with a shade of 'grumble' in the bass and some dulling of treble content. The rock excerpt had a slightly edgy quality in guitar over a dim treble but the midband was detailed and backing vocals well differentiated. The crossed pair miked chamber recording showed good depth imaging though the flute overtones were thought to be a little feathery and edgy.

Tuner

The T-9 is a true digital synthesiser tuner though the up/down scan facility has to be operated by pressing the up or down button in conjunction with the 'auto' strip next to these buttons. The five FM and five AM presets are made operational by using the '1-10' keypad to enter the required frequency which is then transferred to the memory for a particular preset. There is no long wave facility on the T-9 – In compensation there is a calibration tone to adjust the record level on the cassette deck for off-air recording before the broadcast; additionally the tuner has a variable output level.

The tuner measured very well indeed with the results spoilt only by a treble dip in the frequency response. Oddly, this did not seem too important on auditioning as the Teac was barely distinguishable from the reference tuner on speech though it sounded slightly hard. Again with music the tuner produced an excellent sound quality lacking only the weight of the reference in piano. This suggests that some of the response problem may be due to the amplifier. Medium wave reception had excellent clarity and was close to the reference.

Cassette

With its meters illuminated the Teac V-9 cassette deck is every part the Quad-owner's nightmare – but behind the drama of its colour scheme there is a cassette machine which offers well-above-average performance on all measured parameters and is simple to operate. Record level is set with two sliders which are ganged together but can easily be moved independently – a nice touch for even fades. The soft touch transport buttons are to the right of the cassette hatch which unfortunately doesn't have an internal light – though head access for cleaning is good. TDK SA-X tape was used for auditioning on the record/replay test against source. The orchestral test piece lacked the last ounce of treble in brass but the sound was considered to be very good indeed. The rock excerpt was slightly muddy with a lack of smack in the kick drum passage, and a lack of the tactile sound of plectrums on guitar strings.

Pre-recorded tape replay with the ferric orchestral tape showed some upper midband boost though the image was considered good. The chrome rock tape sounded a bit thickened and lacking air but the sound was good and stable. It seems quite possible that the dulling effect was due to the amp.

Speakers

The S-7 speakers are finished in grey paint with a plastic trim around the front edge of the cabinet where it joins the non-removable metal grille. The cabinets are made in 12mm Medite material which seems to have been chosen more for its ability to take a high paint finish than for its acoustic properties. Rag waste damps the enclosed air volume. There is a three-component crossover and a treble level potentiometer is provided. The 200mm paper mid/bass unit crosses over at 6kHz to a 50mm cone tweeter. The ⅓ octave in-room response we obtained shows there to be a very strong midband output with a rapidly falling treble with some high frequency peakiness. Bass is not evenly rolled-off and suggests that the cabinets resonate. On auditioning it seemed too that the speakers were subjectively more balanced with the treble level control turned up.

Orchestral music through the S-7s sounded boomy and hollow even at low levels. The orchestral image was badly mangled by the sucked-out presence band too.

The rock track produced an absurdly hollow knocking sound rather than true bass while even multi-miked images seemed dependent on the listening position – remember the speakers were used on their sides on the chrome stands. The string quartet recording suffered from a 'fat' surface fizz while string tone was woodily coloured in the midband. The crossed-pair chamber music disc reproduced without real imagery as a hollow echoing smear with veiled detail and shrill whistly overtones in the flute.

Turning from the reference system to the Teac disc front end produced a very central image with the orchestral test piece. The rock track was now very forward with a muddled midband while bass was a hollow booming joke. Piano reproduced as a clangy resonant wash.

Summary

The Teac Ace 7D system contains a good turntable with low mass arm capable of

accepting good quality medium- to high-compliance designs. It is certainly capable of better sound than many of the other turntables reviewed in this book. The amplifier has good switching facilities though there was some question raised about its subjective treble performance. The tuner proved capable of fine sound. The T-9 is an unusual design with its selectivity sacrificed for extremely low distortion, an acceptable trade-off. Its selectivity as it stands is more than adequate for UK reception conditions with well-spaced FM stations – and suggests that this tuner is not suitable for long-distance reception but is optimised for high quality reception of local stations, which was borne out in listening.

The V-9 was biased for high-bias, high-performance tapes which limits compatibility with ferric tapes apart from the highest bias formulations like TDK AD – others will sound unduly dull. In the chrome position only BASF Super Chrom II and Maxell UDXL IIS are likely to be compatible in addition to the recommended TDK SA-X. On the plus side, these tapes do give a performance close to metal tape, and cost less!

The speakers cannot be considered as high-fidelity products though rest of the equipment is so good that it deserves recommendation even with their inclusion. The Teac equipment reviewed here is also available in a conventional black rack without speakers as the Ace 7L10 system for £550, and had we reviewed the latter package it would almost certainly have been rated a 'Best Buy'. The Teac equipment is almost unique in offering tastefully 'over the top' styling to attract the eye – but also providing good quality sound and useful facilities.

TEAC ACE 7

DISC (performance via amplifier)

Frequency response	20Hz – 15kHz	good
Stereo separation	– 23dB	above average
Distortion	1.2%	average
Hum and rumble	– 67dB	very good
Hiss	– 75dB	above average
Speed variations	0.05%	excellent
Speed accuracy	0%	excellent
Tracking ability	20cms/sec	excellent

TUNER (performance via amplifier)

Frequency response	40Hz – 5kHz	very poor
Stereo separation	– 46dB	very good
Distortion	0.04%	excellent
Minimum noise	– 72dB	very good
Aerial signal for minimum noise	1mV	good
Selectivity between stations	60dB	below average
Sensitivity, mono	2uV	good
Sensitivity, stereo	25uV	above average

Signal strength meter levels (1) 3.2uV (2) 5uV (3) 25uV (4) 80uV (5) 160uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

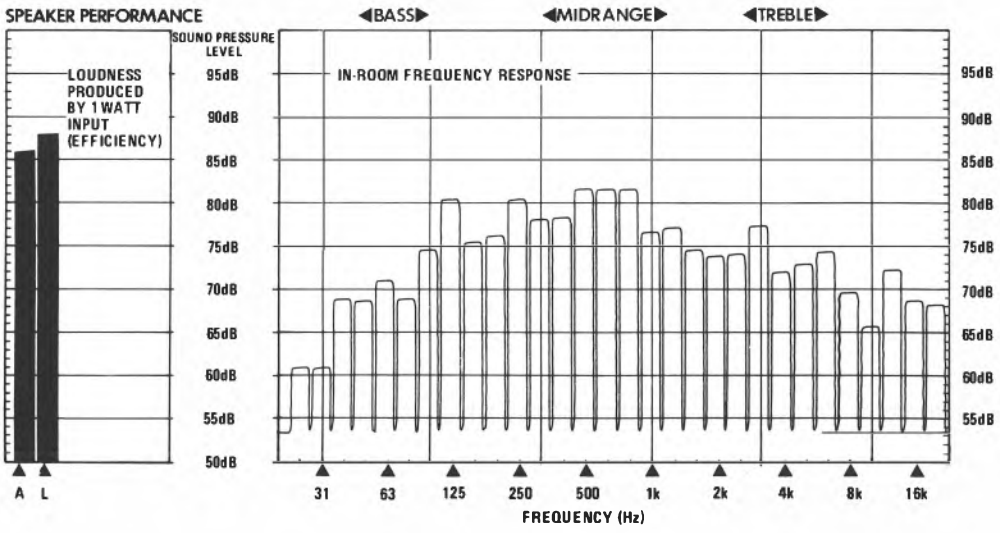
Ferric or Normal tape setting	TDK AD	
Chrome tape setting	TDK SA-X	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	28Hz – 14kHz	above average
Chrome tape setting	26Hz – 12kHz	average
Metal tape setting	26Hz – 13kHz	average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 11kHz	very good
Chrome tape setting	40Hz – 12kHz	excellent
Stereo separation	– 40dB	good
Distortion	3.7%	poor
Noise, Dolby in:		
Ferric tape setting	– 61dB	excellent
Chrome tape setting	– 64dB	excellent
Metal tape setting	– 61dB	excellent
Speed variations	0.05%	excellent
Speed accuracy	0%	excellent

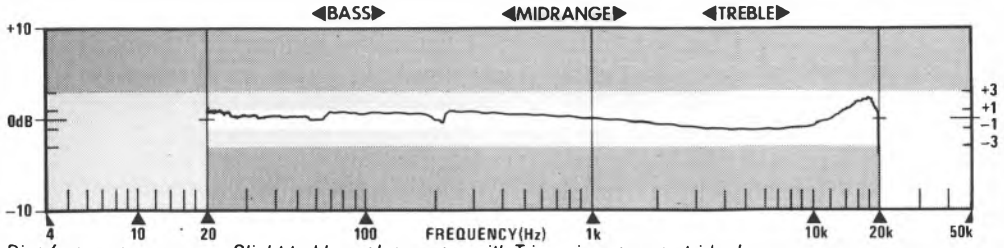
AMPLIFIER

Power output, per channel	60 watts	high power
Potential maximum volume with speakers supplied	107dB SPL	

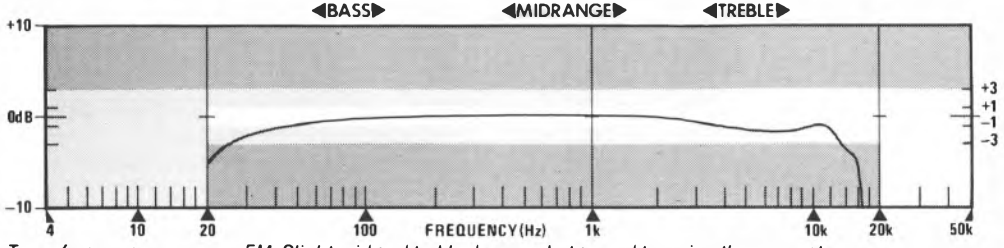
GENERAL

Rack dimensions	78cm x 52cm x 43cm
Speaker dimensions	31cm x 45cm x 30cm
Price	including speakers, £649

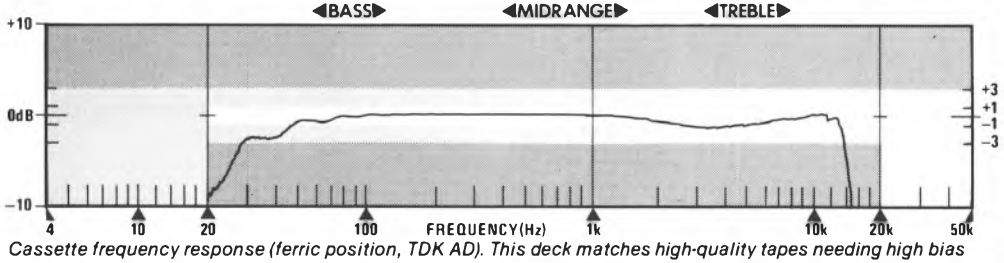




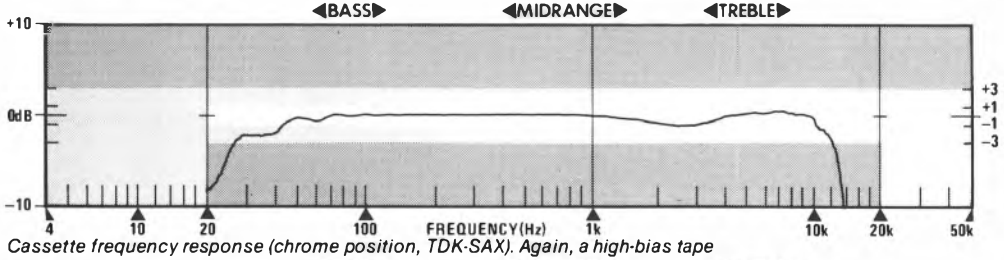
Disc frequency response. Slight treble peak-compare with Trio, using same cartridge!



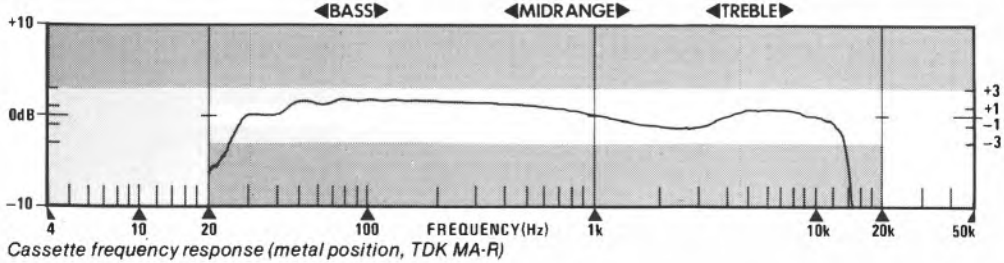
Tuner frequency response, FM. Slight mid and treble droop – but a good tuner in other respects



Cassette frequency response (ferric position, TDK AD). This deck matches high-quality tapes needing high bias



Cassette frequency response (chrome position, TDK-SAX). Again, a high-bias tape

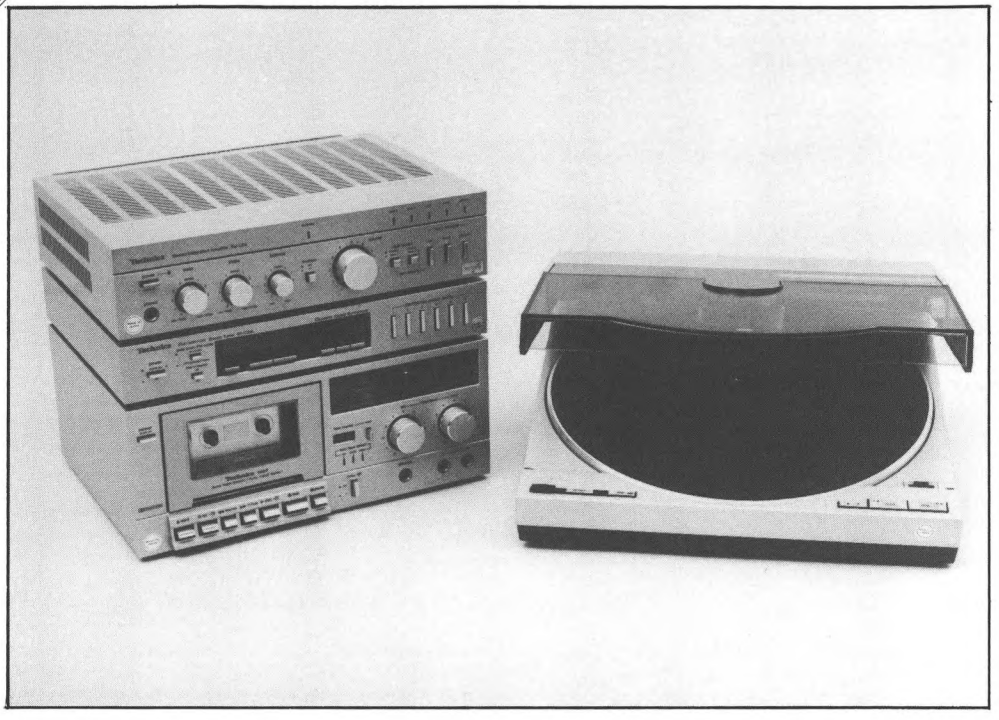


Cassette frequency response (metal position, TDK MA-R)

RECOMMENDED

Technics Mini Serie

National Panasonic (UK) Ltd, 107-109 Whitby Road Trading Estate, Slough, Berks SL1 3DR
Tel Slough 34522



Technics were not only one of the first of the major Japanese manufacturers to have a miniature hi-fi system on the UK market but were the first to produce a truly miniature turntable to match this equipment. This model, the SL10, turned heads by being little bigger than an LP record sleeve, just three inches high and capable of being used stood on its edge. The SL7 turntable is a less expensive derivative of this pioneering model and the system it supports is a generation on from the first Technics mini.

Neither speakers nor a rack are included in the price though a cartridge of very much more than basic specification is provided in the SL7 turntable. A rack for this equipment would be redundant as the Mini Serie equipment can be used in the smallest corner of domestic furniture anyway.

Disc

The reduction in size compared with a conventional turntable is achieved by throwing out the conventional pivoted arm and incorporating a tiny pickup arm in the turntable lid which tracks radially across the disc.

Conventional pickup arms track an arc across the record which is itself cut along a straight radial path. Distortion in conventional arms is minimised by the offset geometry and the arm's length in relation to the distance between the spindle and its pivot. Theoretically the straight-line radially-tracking (or 'parallel tracking') arm as in the Technics SL7 can achieve zero tracking distortion though this is limited in practice by the bearings used and the servo control motor system now necessary to drive the cartridge actively across the disc surface.

In addition to the automated arm in the turntable lid, there is a centrally sprung record clamp that fixes the disc firmly to the platter when the lid is closed and allows the deck to be used in the upright position. Operation is simplicity itself as the record is put on the platter, the lid closed on it and the play button pressed. The arm if necessary can be cued back and forth across the disc surface to pick out

individual tracks. The logic operation of the SL7 is foolproof and the turntable is both beautifully constructed and massively well built offering good isolation. Almost uniquely, the SL7 can be used with a 12 volt DC power supply for in-car or caravan use though it is recommended that the unit is not used in a moving car!

The Technics cartridge fitted into the SL7 arm is designated the EPC P202C and this is a derivative of the excellent EPC 205CMk3 cartridge, sharing with that well-received design the hollow boron pipe cantilever, the low inductance coils (ensuring electrical compatibility with amplifiers having high input capacitance) and a square shank solid diamond elliptically ground stylus of high quality. It is possible to further upgrade the cartridge to the 305MC moving-coil model as used in the SL10 player though a step-up device would be needed (the extra amplification stage for moving coils is already included in the SL10). Shure and Ortofon should both soon have cartridge models on the market which will plug directly into the SL7's arm but the choice is limited and a tracking force adjustment range with this arm is only 1.0 gram to 1.5 grams.

During measurement the P202 cartridge in the SL7 turned in a truly excellent frequency response plot though the measured distortion was poor due to Technics' rather high vertical tracking angle. Excellent tracking results were obtained on the test disc with all bands cleared. The SL7 motor unit showed excellent speed stability and was quiet in hum/rumble and hiss terms.

The SU-CO4 amplifier is a compact design yet delivers 40 watts on test. Usefully, the amp can handle two tape inputs and the tone control and balance have good characteristics, the centre detent on the bass and treble controls being a defeat setting. The loudness contour offers a 9dB boost at 50Hz and no treble compensation (at −30dB attenuation). Speaker cables are connected through good twist-to-lock connectors and the neat LED input indicators finished off a smart looking compact unit.

As no speakers are supplied with the Technics Mini Serie system all auditioning was carried out with the KEF Coda II reference speakers. Tracking at 1.25 grams the SL7 produced excellent imagery with good image depth. There was a fine weight to orchestral climaxes while as testimony to the deck's good isolation bass had both accurate pitch and power.

The rock excerpts had a lively tactile sound with plenty of clean detail though the sound could be steely in the treble region of guitars and vocals. Bass was again tight and clean though there seemed to be some emphasis in the upper bass region. The crossed pair chamber music recording was reproduced by the SL7 with a real sense of acoustic space, with solid images of the individual instruments positioned accurately in depth with good separation. The sound was clean and bright though when the amplifier was really pushed it could begin to sound awfully glassy and hard.

Piano music, being a fine test of the integrity and dynamic performance of a disc system, was included in this disc-only listening test. The piano tracks chosen sounded percussive and tight with the recorded acoustic well revealed and a clean weighty bass quality. There was no confusion in climaxes though some fizz was noticed from the disc surface emphasised by the cartridge's tendency to sound hard.

Tuner

The ST-CO4L tuner is a 'digital synthesiser' three waveband design. Six presets are offered each on FM and AM, the programming and FM/AM buttons being set beneath the digital frequency display window. There is no signal strength meter and no aerial sockets, instead bare wire terminals are provided on the pack panel.

The tuner was technically very competent with a good frequency response, wide stereo separation and low distortion though the noise performance was very poor and this affected both the sensitivity measurements and the aerial signal strength needed for minimum noise. The noise problem was traced back to the digital synthesiser chip which produced a rasping buzz through the speakers which was unacceptably loud on the first sample we tried. A second sample of the ST-CO4L was obtained and though this proved better the problem persisted (the published results relate to this the better unit).

On audition the tuner proved bright and slightly nasally coloured in speech while in orchestral music it was marked down as sounding rather metallic and lacking the bass power of the reference. The synthesiser whine or buzz was quite audible during quieter passages of classical music. Medium wave reception was noise-free but sounded restricted and rather muddled in the midband.

Cassette

The RS-M07 cassette deck features automatic tape sensing and has excellent fluorescent meters with a peak hold facility. The record level input controls were not ganged together and care had to be taken to get an even fade on both channels. Head access was very good as the door over the cassette compartment is removable.

During testing for compatible tape types we came up against the problem that will be facing owners who wish to use metal tapes that do not have the tape sensing cutouts on the cassette

spine. The RS-M07's automatic bias/EQ tape selection facility depends on these cutouts – without them it cannot sense a cassette as requiring metal bias. The auto tape sensor also prevented us from using the test tape to measure replay-only response accuracy in the chrome equalisation position for similar reasons. Technics in their literature with the RS-M07 recommend the use of Technics tape, which apparently is bought-in from TDK. Though Technics tape is on sale in the UK it is not common and we have therefore recommended the more familiar brands Maxell UDXL I, II and Scotch Metafine as being the most compatible.

TDK SA tape was used for the auditioning as this should correspond closely to the manufacturer's recommendations and performed similarly to UDXL II. The orchestral test piece was recorded and replayed against the source when a clangy edgy treble was noted though the midband and bass was felt to be good and flat. On the rock track drums and bass guitar were tight and powerful though vocals and cymbals were slightly edgy.

Pre-recorded cassette replay showed the deck to be running noticeably slow. The ferric orchestral test tape sounded a trifle muffled in the midband with a lack of openness in the treble. The chrome tape sounded commendably flat with a detailed midband and neat bass quite as good as the reference. The slow running seemed to be less bad at the beginning of a tape.

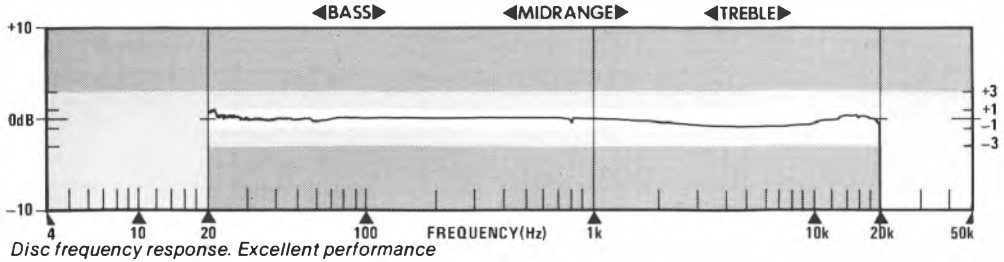
Summary

The SL7 turntable is an excellent performer and can in its own right be strongly recommended. The tuner was simple to operate but suffered from severe noise, the second sample missing the claimed – 73dB noise specification by 4dB while the first had proved totally unacceptable at – 61dB, some 12dB louder than the quoted noise figure. It is suggested that the potential customer check the sample of the tuner he/she buys as the synthesiser buzzing seems to vary significantly between samples. Without this problem the sound quality was good if bright.

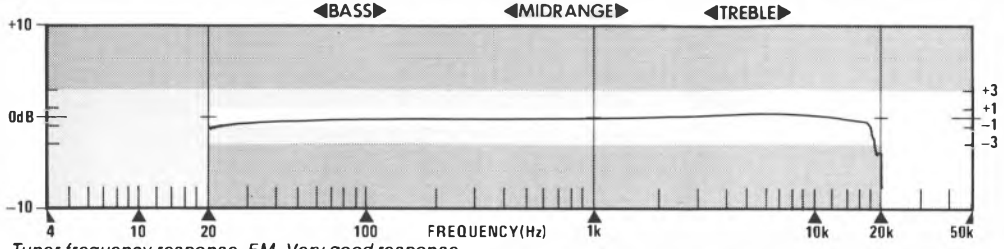
The cassette deck proved capable of fine sound quality on pre-recorded tape replay, though it ran slow. A good response can be obtained with blank cassettes though the auto tape sensing limits the use of the RS-M07 with metal tape cassettes not having suitable cut-outs. In overall terms the system can produce fine sound quality and is exceptionally well built. A recommendation must therefore be in order.

TECHNICS MINI SERIE

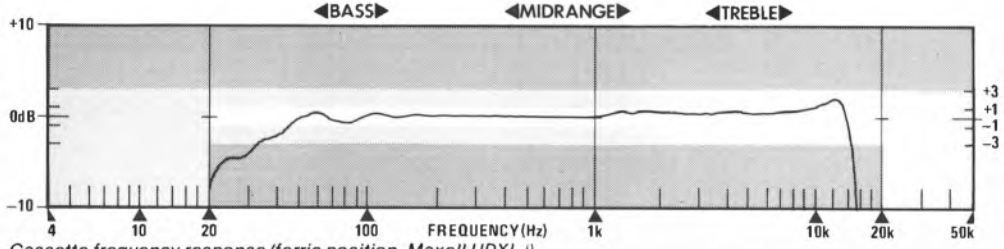
DISC (performance via amplifier)		
Frequency response	20Hz – 20kHz	excellent
Stereo separation	– 20dB	average
Distortion	2.5%	poor
Hum and rumble	– 66dB	good
Hiss	– 78dB	excellent
Speed variations	0.04%	excellent
Speed accuracy	0.1% fast	excellent
Tracking ability	25cms/sec	excellent
TUNER (performance via amplifier)		
Frequency response	20Hz – 18kHz	very good
Stereo separation	– 48dB	excellent
Distortion	0.1%	excellent
Minimum noise	– 65dB	very poor
Aerial signal for minimum noise	320uV	due to high noise
Selectivity between stations	70dB	good
Sensitivity, mono	5uV	poor – high noise
Sensitivity, stereo	50uV	poor – high noise
Signal strength meter levels	– None	
CASSETTE (performance via amplifier)		
Tapes found most suitable from manufacturers recommendations and used for tests:		
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	Maxell UDXL II	
Metal tape setting	Scotch Metafine	
Frequency response, record/replay:		
Ferric tape setting	40Hz – 14kHz	above average
Chrome tape setting	40Hz – 13kHz	above average
Metal tape setting	45Hz – 13kHz	above average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	45Hz – 12.5kHz	excellent
Chrome tape setting (Auto tape EQ selection)		not tested
Stereo separation	– 56dB	excellent
Distortion	0.9%	good
Noise, Dolby in:		
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 59dB	typical
Metal tape setting	– 61dB	good
Speed variations	0.1%	above average
Speed accuracy	0.8% slow	poor
AMPLIFIER		
Power output, per channel	40 watts	medium power
GENERAL		
Dimensions	31cm x 35cm x 35cm	
Price	including speakers, £580	



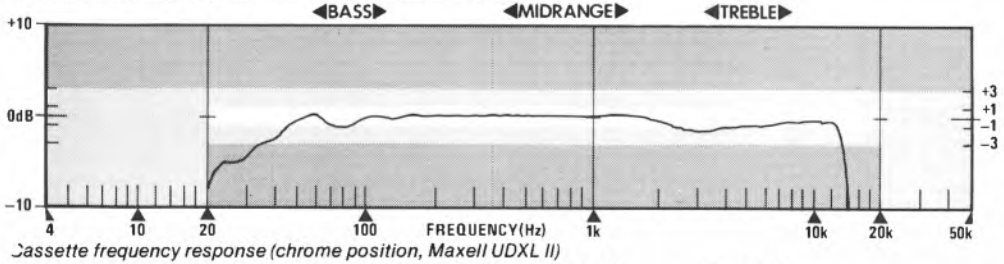
Disc frequency response. Excellent performance



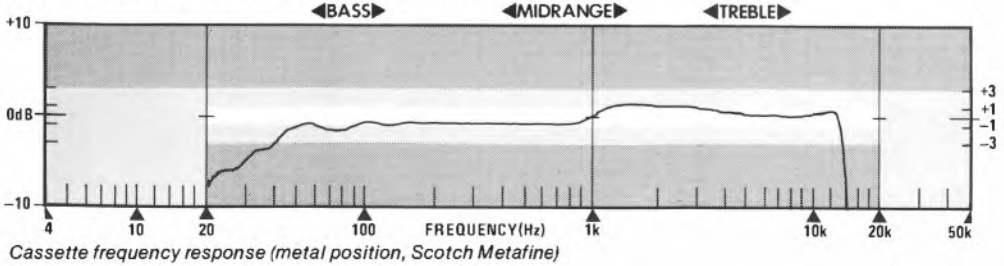
Tuner frequency response, FM. Very good response



Cassette frequency response (ferric position, Maxell UDXL i)



Cassette frequency response (chrome position, Maxell UDXL II)



Cassette frequency response (metal position, Scotch Metafine)

Tensai Slimline

Tensai (UK) Ltd, 1-4 Dawson House, Mount Farm Estate, Milton Keynes
Tel (0908) 644747

Tensai's Slimline system take up no less room than any of the other rack systems bar the true minis. However, the amplifier is split into separate pre- and power-amp units, which are of slim proportions. The Tensai 70 rack was solidly packed though the roughly cut cardboard packing produced volumes of 'bits' when the box was opened. Instructions were a photocopied sheet which lacked detail; assembly was slow as little pre-assembly was done for the customer and holes were not drilled out properly or were in the wrong place.

When assembled the Tensai 70 rack was not very stable, though with its good hinges and glass work it looked quite stylish.

Disc

Tensai's direct drive auto-return turntable, the TD-530D, does not sport one of the more fashionable straight wand type low mass arms but is fitted with an S-shaped arm with conventional SME style plug-in headshell. The fitted cartridge is an Audio-Technica model which provided competent though not exceptional tracking.

The slimline TP-2200 pre-amp can handle inputs from disc, tuner, two tape decks and an auxiliary TV or cassette play-only source – 'tape 2' is a 5 pin DIN connection only while all others are phono sockets. The tone controls cover treble, bass and midrange being centred on an 8dB cut or boost at 1kHz in the midband and the same range at 40Hz and 20kHz. A subsonic filter with a gentle slope operates below 20Hz but cannot really be said to attenuate low frequencies fast enough. The high filter is a similar gentle slope acting from 7kHz upwards in the treble – this type of filtering can only be of use with very inferior tape or noisy FM broadcasts. The loudness control offers a bass boost only. Microphone mixing for DJ-type voice-overs is offered on the pre-amp though this feature seems more popular in Japan than it is here; the channels have independent volume control on a ganged volume knob.

The TM-2250 power amp styling matches the pre-amp with the large right hand side knob

being used for speaker switching rather than volume. Two needle meters with switchable sensitivity are provided in addition to a headphone socket. On test the amp delivered 40 watts which is really no more powerful than any of the conventional amps in similarly priced systems.

The Tensai turntable and pre/power amp combination were first auditioned through the reference speakers, when a thin string tone and artifically deep stereo image were noted with orchestral music. The system seemed quite dynamic and had a fairly well controlled bass though the cartridge disliked the heavily modulated brass passages on this disc – and voiced its opinion in 'spitty' mistracking. This mistracking produced an edgy quality in rock vocals despite the rolled-off treble response. Electric bass was prominent and chest tones in vocals were emphasised, though overall the sound on the rock excerpt was considered fairly tight and rhythmic.

The crossed-pair chamber recording was given a rather generous image depth due to the dip through the presence band though stereo separation was fair. This true wide dynamic range recording allowed amplifier hum to be heard at average listening levels during quiet passages on the disc. In general the Tensai disc 'front end' was considered to give good sound.

Tuner

Tensai's TT 3245 tuner offered exceptional performance on test with low distortion wide stereo separation and a textbook frequency response trace. The tuner has connection for 300ohm balanced aerial inputs only which means that the consumer will be more likely to use a 'rabbit-ear' indoor wire dipole rather than get a balun transformer to match a 75ohm unbalanced input from a good roof aerial – which seems a shame as the tuner can provide exceptional results.

Tuning proved easy with the five-segment centre tune and easy flywheel effect on the tuning knob. A record-level oscillator is built into the TT 3245 which enables the user to set up the cassette deck to the right record level for off-air signals – this takes away the worry about getting the levels right while you should be taping the broadcast. Another feature is the switchable 'wide' or 'narrow' bandwidth, which can help with the reception of weak stations in close proximity to louder unwanted signals when set to 'narrow'.

Speech off-air was considered excellent with only the slightest clacky colouration in male voice and a lack of bass weight compared to the reference tuner. Orchestral music showed an almost identical frequency balance to the reference though image depth appeared not quite as accurate. Medium wave reception was considered good.

Cassette

The TFL 815 cassette deck has an extra in the form of an output level control which will enable this deck to be matched on replay level through other systems. Record levels are set with a concentric ganged knob. While there is no Dolby indicator and only combined switching for bias and EQ there is excellent head access.

Tensai makes no tape recommendations for their machine though we found BASF Super Chrom II to offer the best match and so this tape was used for record/replay listening against source. The orchestral excerpt sounded hissy and uneven with a dull muffled treble quality. The rock bass lost all its dry punch and cymbal crashes were considered rather dead sounding. Measurement showed part of the problem to be due to poor head to tape contact which produced dropout problems and the uneven replay which caused the deck to be marked down in auditioning.

Ferric pre-recorded tape showed a rather 'forward', midband-prominent sound with an instability on pure tones from flutes, piccolos and so on. Chrome pre-recorded cassette replay showed a dull bland, midband-forward sound. Pre-recorded replay sounded noticeably fast.

Speakers

Tensai's TS 9170 speakers incorporate three Japanese drive units in a large unbraced 12mm thick chipboard cabinet. A tiny 4-element crossover acts between the 240mm pleated paper bass driver, a 90mm paper midrange unit with a sealed back, and a 40mm paper cone tweeter with a hard plastic dust cap. The enclosed volume contains a thin layer of rag waste for damping. Connections are made with screw-head terminals.

The speakers on the reference system produced a dated, boxy sound from the orchestral piece, the uneven response plotted in the ⅓ octave analysis showing up on audition as a loose resonant bass with a big midband boost. There was a treble energy lift but no real air or openness in strings. Female vocals in rock music sounded too chesty while drums were feebly loose and boomy. The string quartet sounded bright but not edgy, though the acoustic in which they were recorded now sounded very hollow. The crossed-pair wind quintet recording was very thickened in the important mid tones and the speakers were not successful in conveying the accurate imaging available with this mike technique.

The Tensai speakers and disc system proved

unfortunately to be a subjectively nasty combination. The orchestral excerpt revealed a woolly bass and a thick midband which produced a 'fat' brass tone with a hard 'edge' – due no doubt to the tracking difficulties the AT cartridge had on this piece, along with a tweeter resonance. Rock music was quite 'authentically' coloured by the speakers and sounded very like a large PA system with resonant bass, spiky guitar overtones and boxy top.

Piano lost its percussive attack when reproduced by this system, sounding boxy and hollow with a muffled lower-mid and bass. Surface noise and recorded tape hiss reproduced loudly.

Summary

The fair performance of the Tensai disc system was reduced to an unacceptably coloured level in combination with the Tensai speakers though rock music could sound exciting at times.

The star component of the Tensai system was the tuner which provided exceptional fidelity though this was unfortunately limited by the hum problems tracked down to the power amp output stages. Sadly the potential performance may never be realised in practice due to the 300ohm-only aerial input connections.

The cassette deck suffered on auditioning from bad head to tape contact which produced a typical mediocre cassette sound quality, with instability and unevenness. Noise performance of tapes was not fully realised either as the deck had a noisy replay amp which masked the lower noise floor of the tapes themselves; additionally the deck ran unacceptably fast.

The tape and speaker problems suggest that recommendation is inappropriate at this price.

TENSAI

DISC (performance via amplifier)

Frequency response	20Hz – 5kHz	below average
Stereo separation	– 29dB	good
Distortion	1.1%	average
Hum and rumble	– 65dB	average
Hiss	– 74dB	average
Speed variations	0.06%	very good
Speed accuracy	0%	excellent
Tracking ability	16cms/sec	average

TUNER (performance via amplifier)

Frequency response	20Hz – 17kHz	very good
Stereo separation	– 39dB	very good
Distortion	0.04%	excellent
Minimum noise	– 68dB	average
Aerial signal for minimum noise	700uV	normal
Selectivity between stations	80dB	excellent
Sensitivity, mono	3uV	good
Sensitivity, stereo	40uV	good

Signal strength meter levels (1) 0.6uV (2) 8uV (3) 20uV (4) 31uV (5) 80uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

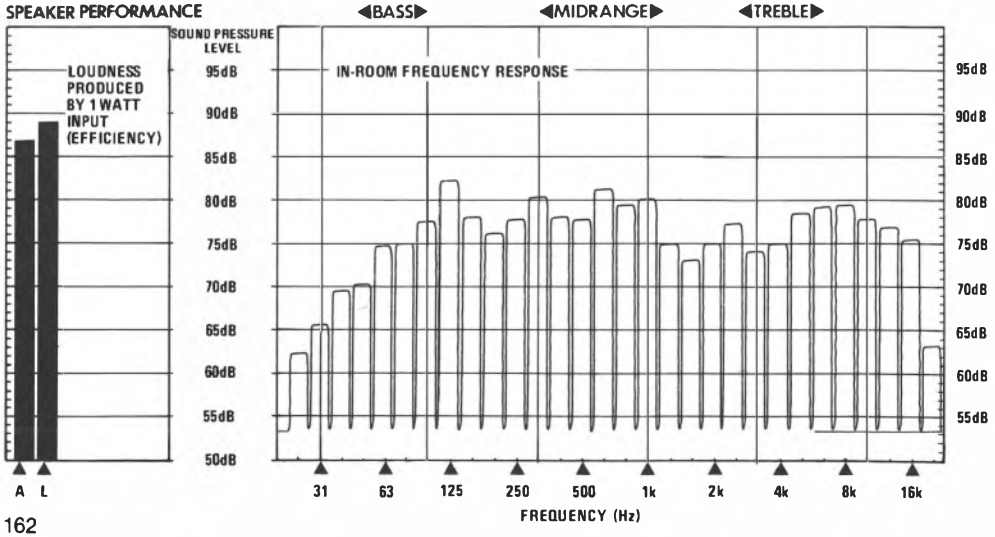
Ferric or Normal tape setting	TDK AD	
Chrome tape setting	BASF Superchromdioxid II	
Metal tape setting	BASF Metal IV	
Frequency response, record/replay:		
Ferric tape setting	45Hz – 13kHz	treble hump
Chrome tape setting	38Hz – 14kHz	above average
Metal tape setting	45Hz – 14kHz	above average
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 11kHz	good
Chrome tape setting	40Hz – 11kHz	good
Stereo separation	– 47dB	very good
Distortion	1.1%	above average
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 57dB	typical
Speed variations	0.13%	below average
Speed accuracy	1.1% fast	very poor

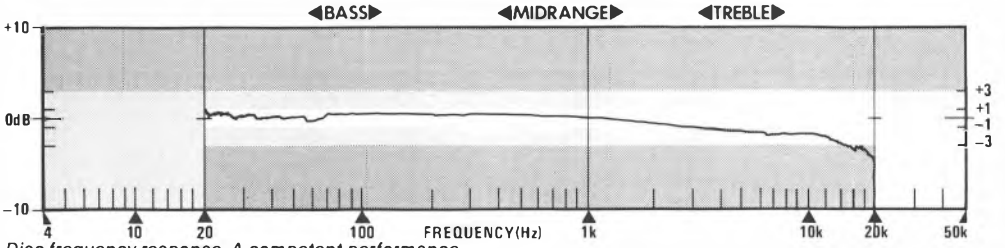
AMPLIFIER

Power output, per channel	45 watts	medium power
Potential maximum volume with speakers supplied	106.5dB SPL	

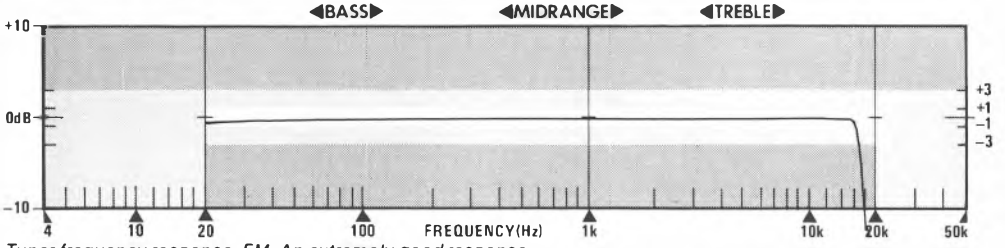
GENERAL

Rack dimensions	98cm x 50cm x 42cm
Speaker dimensions	62cm x 32cm x 26cm
Price	including speakers, £470

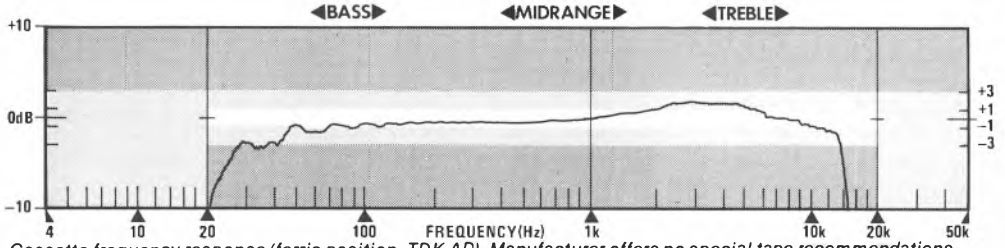




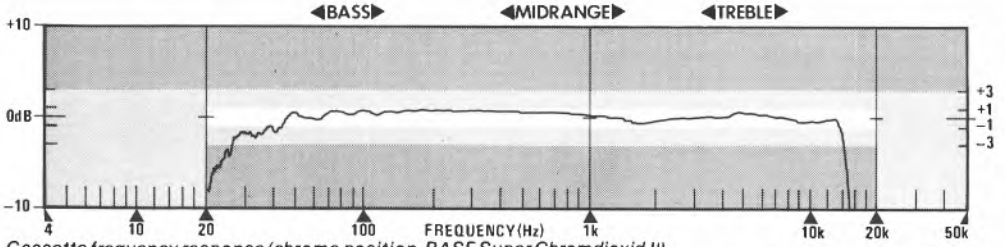
Disc frequency response. A competent performance



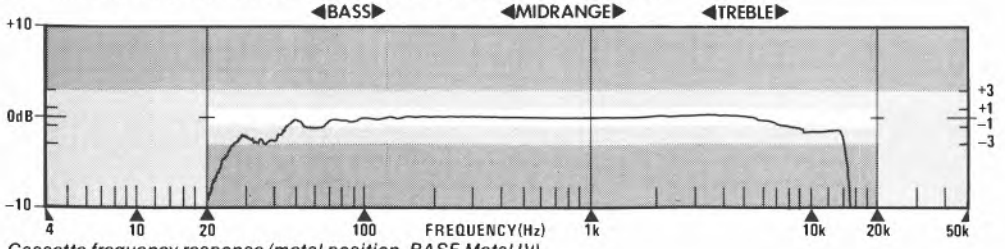
Tuner frequency response, FM. An extremely good response



Cassette frequency response (ferric position, TDK AD). Manufacturer offers no special tape recommendations



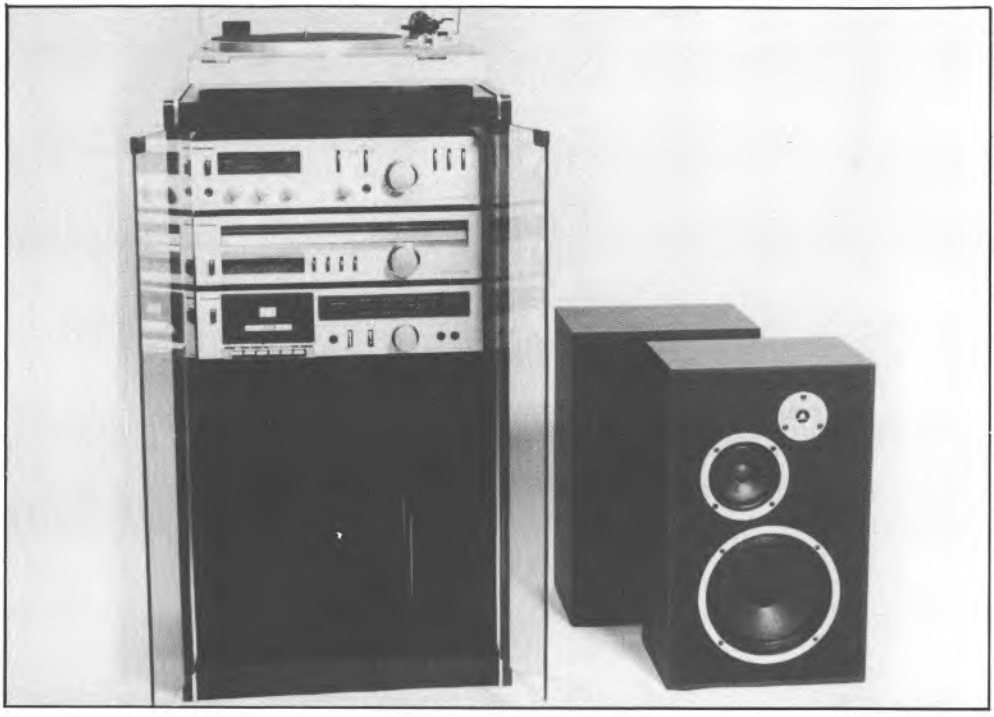
Cassette frequency response (chrome position, BASF Super Chromdioxid II)



Cassette frequency response (metal position, BASF Metal IV)

Toshiba System 25

Toshiba (UK) Ltd, Toshiba House, Frimley Road, Camberley, Surrey
Tel (0276) 62222



While Toshiba use the Aurex brand name to sell more up-market equipment through a relatively small group of dealers, the Toshiba-branded equipment is available through a wider range of retail outlets. In fact, badges apart, Aurex System 40 reviewed earlier and this the Toshiba System 25 have some components in common, namely the turntable and speakers.

The AR-10V rack was very well packed and came with straightforward instructions and a parts check list. Assembly was quick as much pre-assembly had been done for the user on the door catches and hinges. The double glass doors required careful alignment. Rounded corners, chrome trim and red/brown vinyl all helped give an expensive looking finish to a strong floor standing design.

Disc

Toshiba's SR-A25 turntable comes with a cartridge designated the 320M, factory fitted into the straight low mass arm. The cartridge, measured through the SB-A25 amplifier, had fine results for both distortion and stereo separation but gave a very poor account on the frequency response test. Looking further into the problem it was discovered that much of the bass-light, upper-midrange-prominent balance was due to inaccurate equalisation of the phono signal in the pre-amp section of the SB-A25 – something which is not expected from a modern amplifier. Whereas ¼dB limits are normally obtained across a 20Hz to 20kHz bandwidth the Toshiba was 3.5dB down at 20Hz and 1dB up between 3.3kHz and 12kHz.

The SB-A25 was neatly styled with single point LED power meters rather than the more usual and more distracting bar segments. Microphone mixing is provided for voice overs but there is no second tape input and no centre detent for the 'flat' position on the tone controls. The typical plus-or-minus 8dB control is offered at 100Hz and 10kHz by the tone control circuit.

It was quite apparent from the start of the listening tests on the disc and amplifier through the reference speakers that the turntable was

running significantly fast, which was confirmed by measurements. On the orchestral excerpt the imaging properties of the cartridge were appreciated, instruments being well separated out in space though the frequency balance tended to produce too deep an image. Treble was smoothly rolled off though a sharp fizz in the top could be heard in brass instruments.

Rock music had a very midband-rich, forward sound quality with a big upper bass hump from electric guitar though little bass weight below in the drums. The cymbals were rather 'splatty'. The wind quintet recording produced fair imagery with the Toshiba front end, which is a better performance than many systems achieved. The frequency response characteristic already mentioned, though, was responsible for a lack of bloom in the horn and the generally dull sound to the flute, oboe and clarinet. The amplifier seemed to have high levels of hum during the listening tests but this was not confirmed by measurement though it remains a possibility that the cartridge was picking up stray fields from the amp when set above it in the rack.

Tuner

The ST-T25L tuner had a good clear tuning scale and proved easy to use with both its good range of sensitivity on the signal strength LEDs and the tuning pointer changing colour for centre tune. Unfortunately there were a range of distortion values across the tune window, so rarely could the lowest distortion be achieved in actual use – though a minima of about one sixth the quoted value was possible on the test bench. The frequency response trace for the tuner was quite a surprise, showing a similar trend to the phono input – which goes to suggest that the power amp stages of the Toshiba amp are not as flat as they should be.

Auditioning the tuner off-air against the reference showed on speech the frequency response problem immediately as male voice lacked weight and sounded bright and trebly. Small scale symphonic music was again bright with a very noticeable lack of weight in cello and bass parts. Medium wave reception was slightly muffled with a limited treble content but speech was reasonably clear.

Cassette

The PC-X15 cassette deck has all the basics for an inexpensive deck and the wide-dynamic-range LED meters should enable the user to get the best out of any tape. A Dolby indicator lamp is fitted, something which I find useful. Rather than equip the back panel with socketry Toshiba provide flying leads terminating in phono plugs for connection to the amplifier.

Transport controls were of the piano key variety and not that smooth to operate – but more irritating was the transport noise, which could be distracting even with music playing. This is not the first PC-X15 I've heard with this problem either. Access to the tape heads for cleaning was fair.

Using TDK SA tape for the record/replay auditioning, a fatiguing bright treble was noticeable on the orchestral excerpt, which also suffered from a complete lack of low frequency weight in cellos and basses. Rock music sounded 'weedy' and bright with the drum line having no power or impact, cymbals were fatiguingly hard too. The pre-recorded tape replay on the Toshiba PC-X15 could hardly be described as a hi-fi performance – the orchestral ferric tape was fizzy and had a thin brittle string tone and no weight to orchestral climaxes. The chrome rock tape had a sibilant vocal line with a toppy offensively bright sound and lack of power in bass and drums.

Speakers

The Toshiba SS-350s are built to the same specification as the Aurex SS-40 speakers tested earlier on – a comparison of their response graphs shows a reasonably close matching. These UK built three-way speakers contain a 190mm paper woofer, a 110mm paper midrange unit and an 18mm plastic dome/cone tweeter in a large undamped 12mm chipboard cabinet. One layer of fibre is included and the six crossover elements are mounted on a printed circuit board.

With the reference disc system the speaker showed a squeaky top end with a whining violin tone in the orchestral test piece. The image depth was fair but laterally images were rather smeared. The lower midrange was considered muddled while the bass doubled up in the upper bass causing a boomy colouration.

On the rock track the speakers showed a sloppy bass line and fatiguing treble in female vocals though there was no real extension to give cymbals their necessary 'crash'. The string quartet was plummy and murky with an 'edge' to the treble in the first and second violin passages, while lower down the cello part could boom. The chamber music test piece recorded with crossed-pair microphones showed some sense of the ambience and detail of the recorded acoustic though the imagery itself was imprecise. The uneven treble response and lack of high frequencies did not help in distinguishing the clarinet and flute as both were dull and short of overtones.

The combination of the inaccurate frequency response of the Toshiba disc system and the 'twin peak' sound of the speakers didn't bode well for their combined sound. The orchestral test piece on the Toshiba disc system and speakers

suffered from bloated orchestral climaxes and a generally muddled sound quality with little sense of dynamic development in the music. Amplifier/turntable hum was noticeable on both the classical music test pieces while the rock track again suffered from a general muddling and a piercing sibilance in the voice. Bass guitar was sloppy and reproduced boomily on one note. Piano showed a rounded unpercussive bass quality being reasonably fair in other senses when quietly played but degenerating into a boomy hollow sound when the player 'put his foot down'.

Summary

Most of the ills suffered by the Toshiba System 25 can it seems be laid at the door of the amplifier which had a very inaccurate frequency response on all inputs as it turned out. Great care was taken to centre the tone controls and either they were inaccurately set up or there is some more serious problem with this amp – either way this performance is not to be expected from a high-fidelity product. The only other problems with the system had been the fast running turntable and high distortion on the tuner so if this amp fault is untypical then the system would perform well.

The speakers are a typical attempt to give the look of high value by including three drivers in a big box. Two drivers and a fair crossover would have resulted in a better sound quality than the boomy, mid-forward, tizzy sound the SS-350s exhibited, so typical of three badly-integrated drivers.

Recommendation cannot be made for this system as it stands though the faults should be easy for Toshiba to cure – this system would then certainly become worth considering.

TOSHIBA 25

DISC (performance via amplifier)

Frequency response	40Hz – 5kHz	below average
Stereo separation	– 30dB	good
Distortion	0.35%	excellent
Hum and rumble	– 66dB	good
Hiss	– 72dB	poor
Speed variations	0.15%	below average
Speed accuracy	1.2% fast	very poor
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	60Hz – 17kHz	very good
Stereo separation	– 34dB	good
Distortion	1.5%	very poor
Minimum noise	– 73dB	very good
Aerial signal for minimum noise	1.6mV	large
Selectivity between stations	80dB	excellent
Sensitivity, mono	4uV	poor
Sensitivity, stereo	40uV	poor

Signal strength meter levels (1) 16uV (2) 32uV (3) 50uV (4) 80uV (5) 320uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

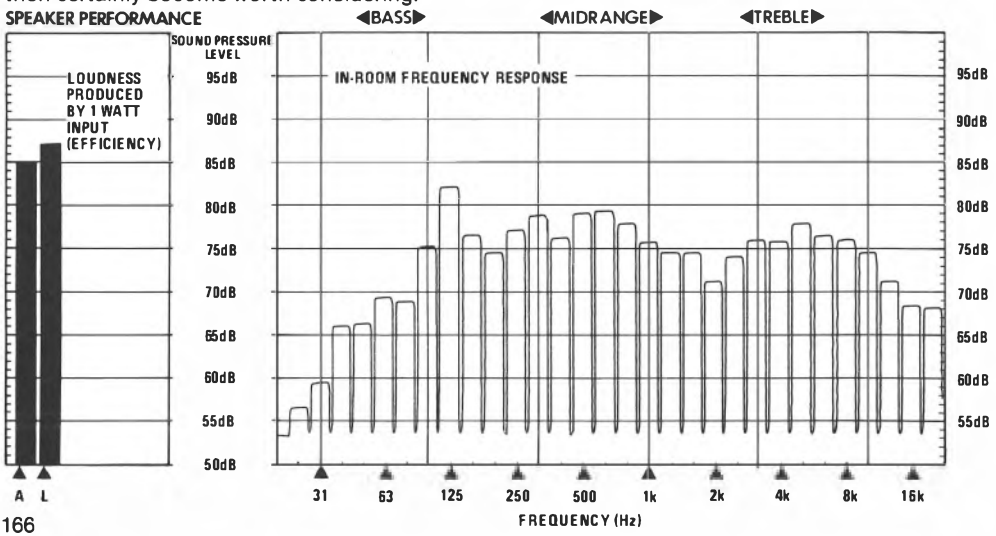
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	Scotch Metafine	
Frequency response, record/replay:		
Ferric tape setting	60Hz – 14kHz	good
Chrome tape setting	60Hz – 14kHz	good
Metal tape setting	20Hz – 14kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	90Hz – 1.5kHz	very poor
Chrome tape setting	90Hz – 1.5kHz	very poor
Stereo separation	– 42dB	good
Distortion	1.4%	average
Noise, Dolby in:		
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 59dB	typical
Metal tape setting	– 59dB	typical
Speed variations	0.08%	good
Speed accuracy	0.2% fast	very good

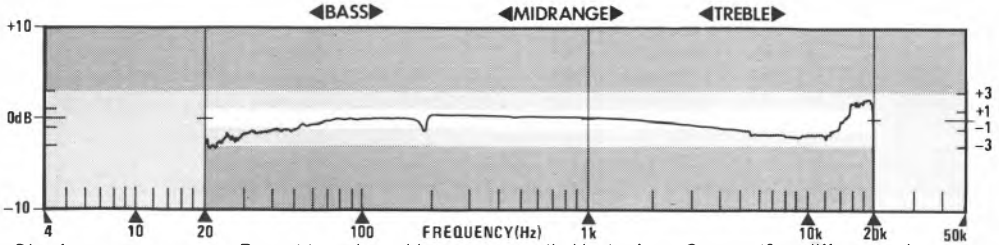
AMPLIFIER

Power output, per channel	40 watts	medium power
Potential maximum volume with speakers supplied	104dB SPL	

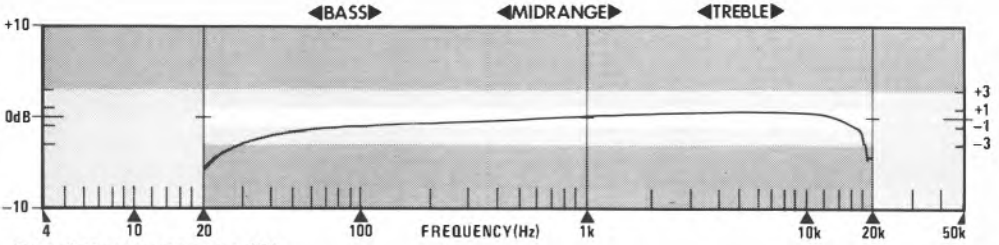
GENERAL

Rack dimensions	89cm x 49cm x 40cm
Speaker dimensions	49cm x 30cm x 20cm
Price	including speakers, £400

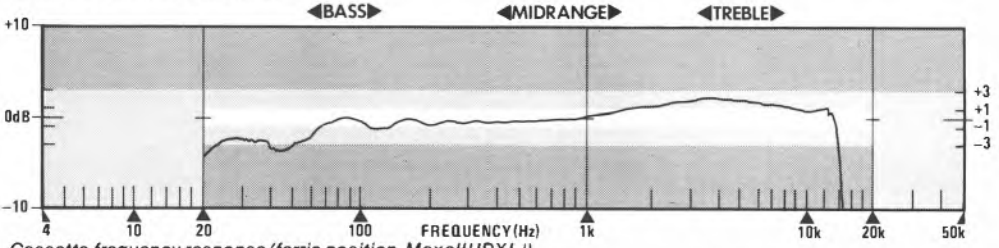




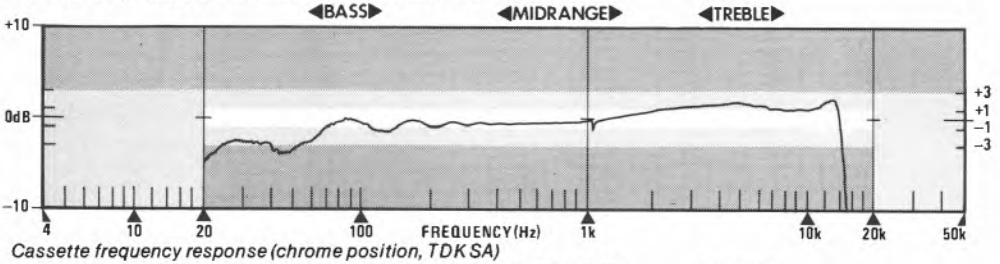
Disc frequency response. Turntable and cartridge are as supplied in the Aurex System 40 – differences in response are due to amplifier characteristics



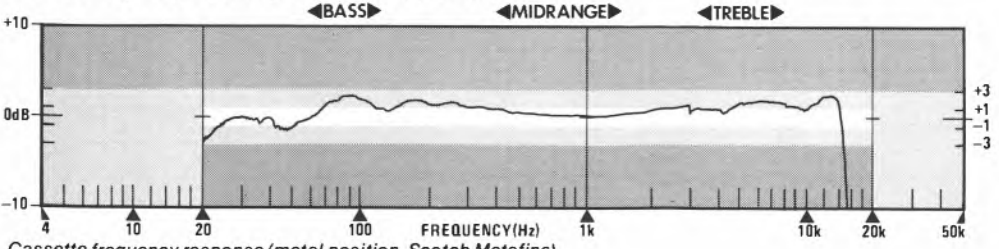
Tuner frequency response, FM.



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, Scotch Metafine)

Trio V30

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

The V30 system is Trio's entry at the very competitive price point of £350 in the rack system market. The SRC-3W rack comes well packed and with clear instructions for assembly printed on one sheet. The rack proved reasonably easy to assemble but to avoid undue strain on the wood screws which bite directly into the chipboard top, shelf and plinth it was necessary to keep the rack squared up during building.

The rack was not completely stable when built partly because it lacked the weight of a full length glass door. The vinyl finish was not particularly impressive, being waxy to the touch and not an especially convincing imitation of wood grain.

Disc

The KD-1600 auto return belt-drive turntable comes factory-fitted with an Ortofon FF15EO/II cartridge. The 'O' designation on this cartridge distinguishes cartridges supplied by Ortofon to hi-fi manufacturers ('OEM' models), from those for sale to the public. The difference seems to be one of stricter quality control checking on the E model and reduced compliance on the EO model.

Record deck controls for speed selection and 'play/cut' are on the top face of the plinth but outside the lid. Moving the arm over the record starts it revolving but only movement of the 'play' button will cause the arm to lower. This allows cueing after the lid has been closed.

The Ortofon cartridge, though tracking marginally less well than a standard FF15E, provided a gently contoured frequency response with a lower midband hump visible. The KA-30 amp carries only the basic facilities, with connections for the simultaneous or individual use of two pairs of speakers being the only real 'extra' – the tape 2 input is a simple auxiliary socket. The tone and balance controls proved none too easy to use as they were both flush with the fascia and prone to bend on their thin spindles. The tone controls are of conventional type, offering a 10dB cut or boost at 100Hz or

10kHz. The loudness button offers a bass boost of 9dB at 100Hz, which is merely a switched introduction of what can be achieved with the bass control. The amp delivered a good 40 watts on test but had high levels of DC offset at the speaker terminals.

Auditioning the KD-1600 turntable and KA-30 amp through the reference speakers it was immediately noticed that the deck was running fast. On the orchestral excerpt the sound was dynamic with some muddling in the bass which could be improved by moving the deck off the rack. Though the balance was dull, the marginal tracking performance of the cartridge in heavily modulated passages seemed to be behind the 'shouty' quality noted. The rock track reproduced with a warm forward sound which, while lacking 'air' in the treble, sounded quite clean. The bass lacked both attack and a clear sense of pitch – this one-note character becoming fatiguing after a while.

The dull balance detracted from the open sound achieved with some systems on the crossed-pair chamber recording though there was, conversely, no problem with surface noise. The cartridge exhibited fairly good stereo separation though the image depth was distorted by the falling response through the presence band.

Tuner

The KT-30L tuner shares the same fascia panel as its more expensive brother, the KT-50L which is included in the 70X system, lacking only the digital frequency readout and servo-lock feature of the up-market model. Sadly both tuners have a confusing muting switch which doubles as an AM selector button between MW and LW.

Though the signal strength meter offered no help in tuning as it was far too sensitive – lighting up all five segments on the weakest stations – low distortion could easily be achieved in practice right across the tune window. The tuning knob however was rather stiff and suffered from backlash, while the centre tune pointer was dim and hard to use.

Comparing the KT-30L off-air against the reference tuner showed it lacking in chest 'weight' in male voice while the midband sounded a little whining and clacky. Symphonic music was bright and lively with good depth imaging. Medium wave reception was quite good with clear diction in spoken word material though the treble extension which helped achieve this did not help reduce the irritation of noise.

Cassette

The KX-50 cassette deck offers the basic features only but lacks separate left and right channel input level controls and a Dolby indicator lamp. The light-touch transport controls proved rather slow to latch but no problems were encountered in use.

The reference chrome-position tape TDK SA was used for auditioning record and replay, when on the orchestral test piece the KX-50 lacked only the weight, power and incision of the source signal. No response problems could be heard except perhaps from a brighter treble. The rock excerpt recording lacked the punch heard from the source but the sound quality was considered to be good considering the asking price of the equipment.

Pre-recorded tape replay with the ferric reference tape was lacking in weight and presence with a thin bright colouration. The chrome pre-recorded tape showed the cassette deck audibly to be running slow which could account for the reported dull, sluggish sound reported despite the measured and audible treble lift. Bass quality of electric guitar was rather muddled.

Speakers

The LSK-200C speakers are two-way designs incorporating a paper mid/bass unit 180mm in diameter and a 40mm paper dome/cone tweeter. There is no true crossover, only a tiny series capacitor to protect the tweeter from large low frequency signals. The undamped chipboard cabinets contained a thin layer of fibre glass over the back panel and were trimmed with a plastic-framed grille cloth.

On the reference system with the orchestral excerpt the speakers exhibited a very uneven response in the treble with a string tone that managed at the same time to be both 'screamy' and 'woody'. Orchestral bass was boomy and confused. The rock excerpt was heavily coloured in the treble with a peculiar compressed sound quality to cymbals which should have been sounding 'open'. Vocals were quacky and nasally coloured. The string quartet recording seemed to have excessive surface noise with these speakers though the treble was both fizzy and sucked out higher up. String tone was whining and nasal with imagery flattened and pushed forward. The crossed-pair-miked chamber excerpt reproduced as a confused resonant jumble with clarinet and flute overtones smeared together in a ringing treble peak. Despite the forward midband quality the large high frequency suck out produced an impressively recessed treble quality.

Playing the V30 disc system with its own speakers showed there to be some element of matching between the disc and speaker sound balances. The falling top end response of the Trio turntable removed the nasal colouration

problems heard with the flatter reference source. The orchestral excerpt lacked precise stereo with left, right and centre clumping of the image. The rock excerpt suffered from a sibilant, whistly vocal line and a muddled bass. Piano too was forward with a resonant confused bass and a clangy colouration.

Summary

Though while not offering the edge in sound quality that one or two similarly priced systems can the Trio V30 nevertheless is a competent performer, speakers apart. There seems little need to worry about cartridge upgrading considering the fine quality of the Ortofon FF15EO, and when the time eventually does come for a replacement stylus one from the model FF15E/II (N 15E/II, available for less than £10) will improve tracking performance into the bargain. Sadly the turntable didn't run at correct speed.

The tuner and cassette deck could both offer good sound quality though one was marred by a useless signal level meter and the other by noticeable slow running (though this will bother users of commercially recorded cassettes only).

The rack did not help the disc sound quality and indeed the lid on the turntable proved to be the source of some colouration. Users could therefore consider siting the rack close to a wall and removing the castors to improve matters. The speakers were no better than other rack system boxes at this price, in fact their treble problems were to some extent tamed by the disc response. A fair performance overall though not one of the price-point leaders.

TRIO V30

DISC (performance via amplifier)

Frequency response	20Hz – 13kHz	good
Stereo separation	– 29dB	good
Distortion	0.8%	good
Hum and rumble	– 66dB	good
Hiss	– 75dB	above average
Speed variations	0.13%	below average
Speed accuracy	1% fast	very poor
Tracking ability	16cms/sec	average

TUNER (performance via amplifier)

Frequency response	40Hz – 15kHz	above average
Stereo separation	– 39dB	very good
Distortion	0.2%	good
Minimum noise	– 70dB	good
Aerial signal for minimum noise	800uV	above average
Selectivity between stations	78dB	excellent
Sensitivity, mono	2.2uV	good
Sensitivity, stereo	26uV	above average

Signal strength meter levels (1) 3uV (2) 4uV (3) 9uV (4) 12uV (5) 18uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

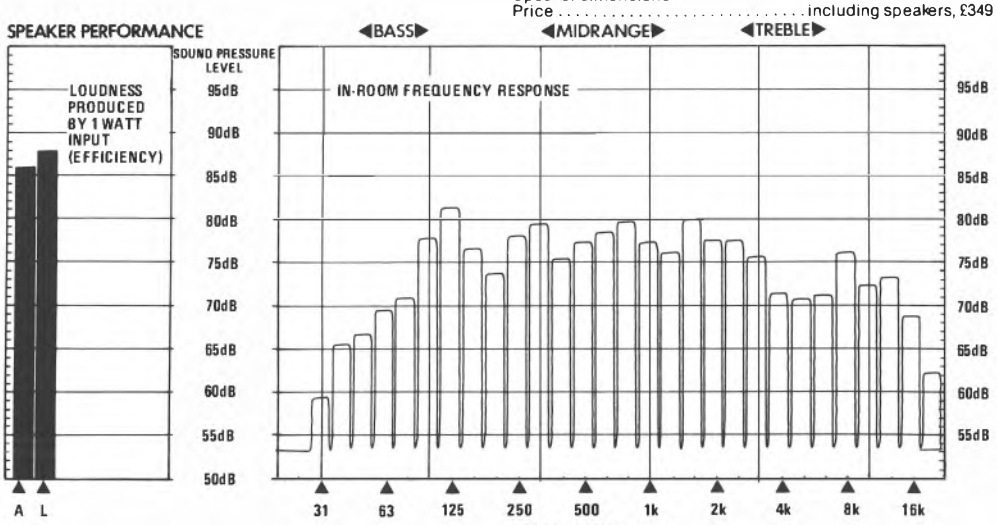
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	32Hz – 13kHz	good
Chrome tape setting	34Hz – 15kHz	good
Metal tape setting	34Hz – 15kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 12kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 42dB	very good
Distortion	1.6%	below average
Noise, Dolby in:		
Ferric tape setting	– 58dB	typical
Chrome tape setting	– 60dB	typical
Metal tape setting	– 59dB	typical
Speed variations	0.07%	good
Speed accuracy	1.2% slow	very poor

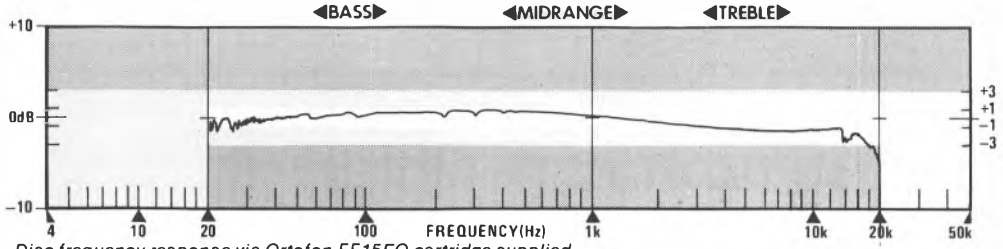
AMPLIFIER

Power output, per channel	40 watts	medium power
Potential maximum volume with speakers supplied	105dB SPL	

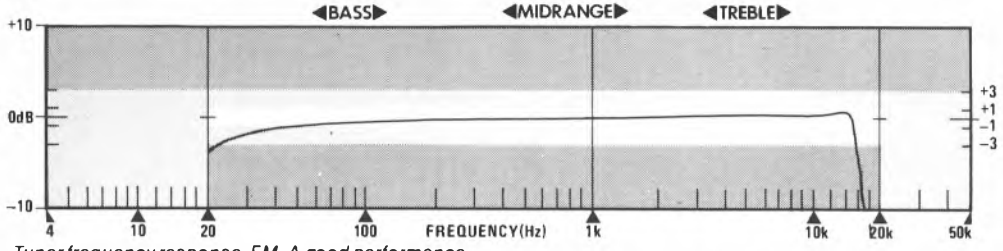
GENERAL

Rack dimensions	86cm x 49cm x 37cm
Speaker dimensions	43cm x 31cm x 21cm
Price	including speakers, £349

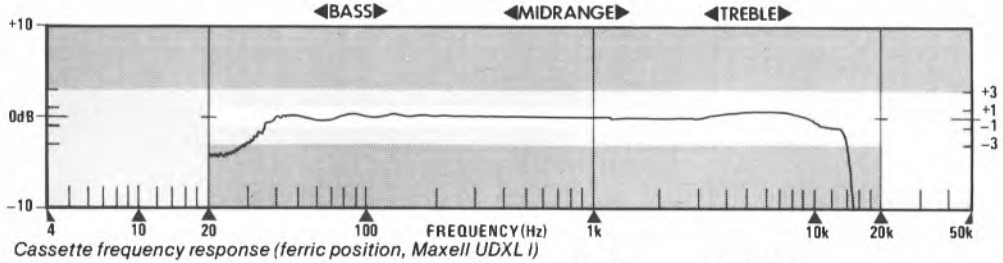




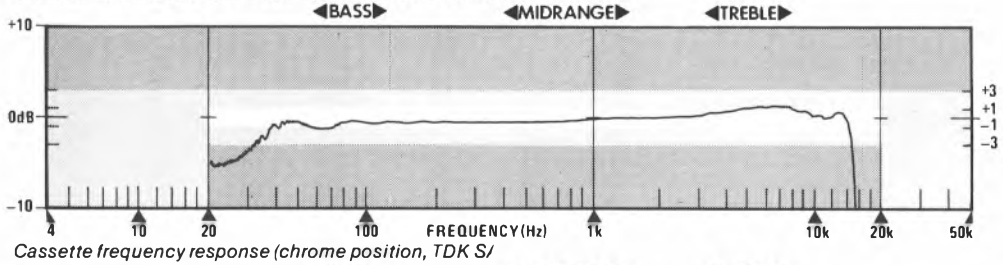
Disc frequency response via Ortofon FF15EO cartridge supplied



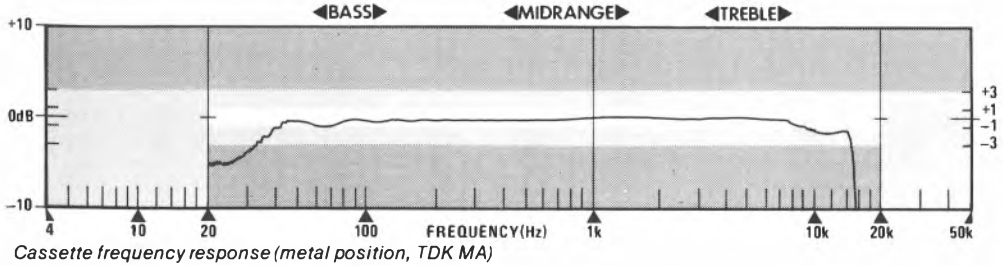
Tuner frequency response, FM. A good performance



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK S/



Cassette frequency response (metal position, TDK MA)

Trio 70X

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

Trio's 70X was one of the largest rack systems tested in *Choice* and it was certainly the tallest. The SRC-7W rack itself is delivered in packing that seemed too lightweight for the heavy sides, large glass door and top. Instructions were supplied on one sheet and while assembly was quite straightforward working from these diagrams it would be advisable to involve two people in building this rack as with any other of the big designs.

The glass lid and chrome trim save the SRC-7W from looking dowdy though the vinyl finish was disappointingly 'plasticky', nevertheless the rack comes well-appointed with a cassette tray and headphone extension socket on the left front of the plinth. With the equipment installed stability was poor due to the high centre of gravity and the rack's being fitted with castors; in use the rack did not prove too good at reducing feedback.

Disc

The KD-40R turntable is a direct drive model with servo control and therefore offers pitch adjustment. A fine speed adjustment indicator, consisting of two red 'overshoot' LEDs and a central green 'on speed' LED, is provided though this proved redundant as the green LED would light across far too wide a range of speeds. Measurement showed the correct speed indicator to light across a range of plus or minus 1% of 33⅓ rpm – which is worse than the inherent speed error of a simple belt-drive deck!

The straight arm comes without a fitted cartridge and is automated for end-of-side return only. An Ortofon FF15E/II was fitted for both measurement and auditioning. This choice of cartridge unintentionally showed up a cartridge matching problem that will exist with the KA-70 amplifier. Measurement revealed an unusually high value for input capacitance of 493pF (normally no more than 200pF) to be responsible for the fatiguing trebly sound from disc – note the 8kHz peak on the response graph. Low-inductance cartridges would show gentler response trends and a more even treble output – Glanz or Grado designs would therefore be a

better match. Indeed we charted a Glanz MFG-11T cartridge through the KA-70 which gave a response flat (±1dB) from 20Hz to 14kHz – a much better performance.

The KA-70 amp delivered over 90 watts on test. While undoubtedly the most powerful amplifier in the racks we tested, and giving the 70X system the potential to be the loudest too, it did sound 'gritty' and fatiguing when driven hard. Conventional tone controls and a bass-boost only loudness facility are provided in addition to a subsonic filter which had too gentle a slope and seemed to act too high up to be of real use. The provision of a stereo/mono button was appreciated though the design of the rotary controls seemed to put visual appeal before ease of use.

Playing the turntable and amp through the reference speakers showed a prominent lower midrange balance with a lack of 'air' in the very top which with the shouty treble peak proved awfully fatiguing in orchestral music. Cymbals in the rock excerpt lacked extension but sounded very 'splatty' and forward despite the clean tracking of the Ortofon. The crossed pair chamber recording suffered from a distorted image depth with a very forward mid, yet the uneven overtone structure of the wind instruments could make them sound hollow and distant.

Tuner

The KT-50L tuner is unnecessarily equipped with both an analogue tuning scale and digital frequency readout. The stiff tuning, absurdly sensitive signal strength meter and wide signal-locked window did not help achieve accurate tuning while two samples of the tuner proved hopelessly noisy – distractingly so on classical music broadcasts. This very poor noise performance affects both sensitivity and quieting measurements.

Speech suffered from an edgy nasal colouration through the KT-50 while on orchestral music the noise performance swamped details of the recorded acoustic. Oboes and flutes were highlighted by the tuner's treble brightness though the bass clarity and weight were good. Medium wave reception was very clear with good diction in speech though noisy.

Cassette

The KX-70 proved to be an operational disaster there being no tape counter, no pause control – and it is possible to go straight into the record mode from play at the touch of a button thereby punching a hole in a favourite tape if its security tabs haven't been broken out. Additionally, the programme search system proved useless on wide dynamic range recordings as it is set up to look for pauses of four seconds duration.

When recording, not only did the bars on the LED meters prove confusing but the inability to alter the left and right record levels independently is without precedent in a deck of this price.

The KX-70 proved badly misaligned for the quoted reference ferric tape type (Maxell UDXL 1), though the machine could achieve good flat results with other tapes. TDK SA was used for record/replay auditioning where a generally good overall sound on orchestral music was marred by grainy hiss and a hollow treble. Rock music sounded distant and lacking in punch though a good flat response was achieved.

Ferric pre-recorded tape replay showed a flat response and a detailed sound with plenty of impact; chrome replay was close to the reference but had a slightly dull top end.

Speakers

The LSK-400B speakers are three-way designs with a simple four-element crossover acting at 3.3kHz and 6kHz to integrate a 225mm paper cone bass driver, a 111mm paper midrange unit and a 45mm paper dome/cone tweeter. The large chipboard carcass is both unbraced and undamped though a thin layer of glass fibre covers the back panel. Though the paper coned drivers and rudimentary crossover should ensure high efficiency the large, thin cabinet, open-backed midrange driver and high crossover point between woofer and mid driver all looked likely to result in coloured sound.

This proved to be the case, as with the older orchestral recording on the reference system the LSK-400Bs had a wiry, thin, hollow, nasal sound. The stereo image was distorted both in depth and laterally. The rock excerpt showed a nasal colouration in guitar and voice, bass was reasonably tight but hollow and overhung on fast kick drum. But in contrast to the orchestral excerpt, the LSK-400B's colouration was subjectively not out of place. The string quartet reproduced with a rosiny, nasal colouration while the speakers failed to make sense of the crossed-pair miking in the final excerpt – while it was obvious, listening to this excerpt, that an instrument was balanced some way away in the stereo image, there was no precision in depth or ambience information.

Using the 70X system's own turntable and amp with the LSK-400B speakers created the loudest sound of any of the systems. The old orchestral disc had a screaming top end with a hollow colourations in strings and woodwinds, and a grumbling bass. Rock music sounded very 'busy' on the 70X disc system though vocals were clacky, sibilant and forward. Electric bass guitar had no real downward

extension while cymbal crashes could sound merely offensive. The solo piano excerpt was spoiled by a hollow rush of vinyl roar from the disc surface.

Summary

Despite being blessed with one of the most powerful amplifiers on test the 70X system failed to do well in almost every other respect. Quality control must have slipped up in tuner production noise – KT-50s for markets other than the UK are reportedly free of the noise problem we found. Factory misalignment of the cassette deck resulted in poor results with the specifically recommended ferric tape type. Although many 'extra' facilities are provided, these are often badly designed.

Trio's apparent desire to offer as visual excitement and high 'perceived value' in the product has resulted in their inclusion of redundant features on the tuner and a lack of even the basic controls on the cassette deck – these basic essentials have been sacrificed for a programme search facility. The unduly high input capacitance value on the amp and the non-functional 'correct' speed indicator on the turntable are inexplicable in view of Trio's proven ability to produce good-sounding, reliable, well designed, value for money equipment. While the 70X may be visually imposing and even impressive in a showroom demonstration because of its high loudness capability it will undoubtedly prove frustrating to use and fatiguing to listen to in the longer term. The Trio 70X cannot be recommended.

TRIO 70X

DISC (performance via amplifier)

Frequency response	20Hz – 14kHz	matching problem
Stereo separation	– 20dB	average
Distortion	1.5%	below average
Hum and rumble	– 66dB	good
Hiss	– 75dB	above average
Speed variations	0.07%	good
Speed accuracy	1% slow/fast	variable – very poor
Tracking ability	20cms/sec	good

TUNER (performance via amplifier)

Frequency response	20Hz – 15kHz	above average
Stereo separation	– 37dB	very good
Distortion	1.3%	average
Minimum noise	– 56dB	extremely bad
Aerial signal for minimum noise	200uV	affected by noise
Selectivity between stations	79dB	good
Sensitivity, mono	2.5uV	above average
Sensitivity, stereo	40uV	affected by noise

Signal strength meter levels (1) 0.6uV (2) 1.6uV (3) 6.3uV (4) 6.3uV (5) 8uV

CASSETTE (performance via amplifier)

Tapes found most suitable from manufacturers recommendations and used for tests:

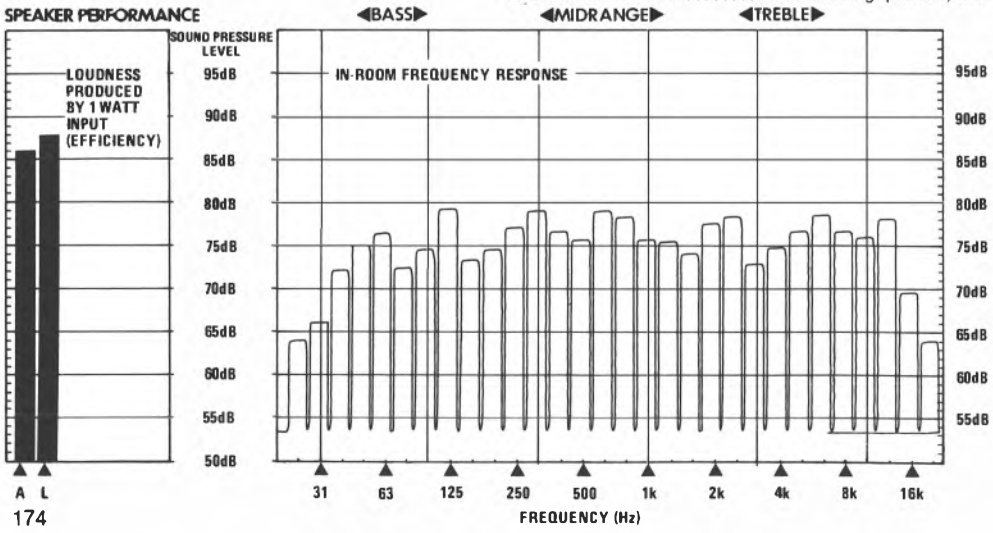
Ferric or Normal tape setting	Maxell UDXL I	
Chrome tape setting	TDK SA	
Metal tape setting	TDK MA	
Frequency response, record/replay:		
Ferric tape setting	20Hz – 6kHz	tape incompatability
Chrome tape setting	20Hz – 13kHz	good
Metal tape setting	20Hz – 13kHz	good
Frequency response, replay of pre-recorded tapes:		
Ferric tape setting	40Hz – 12kHz	excellent
Chrome tape setting	40Hz – 12.5kHz	excellent
Stereo separation	– 44dB	very good
Distortion	1.6%	average
Noise, Dolby in:		
Ferric tape setting	– 57dB	typical
Chrome tape setting	– 59dB	typical
Metal tape setting	– 57dB	typical
Speed variations	0.05%	very good
Speed accuracy	0.5% fast	below average

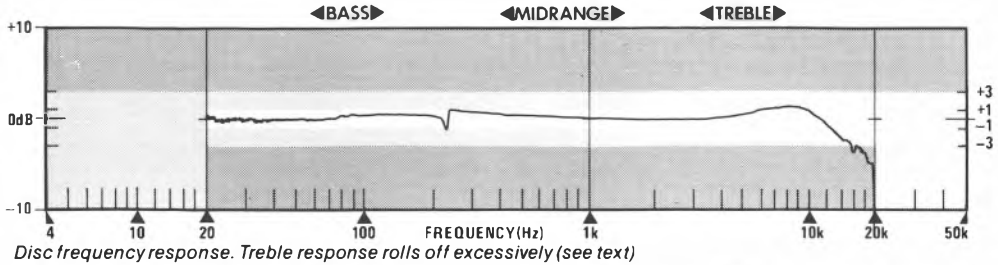
AMPLIFIER

Power output, per channel	91 watts	high power
Potential maximum volume with speakers supplied	108.5dB SPL	

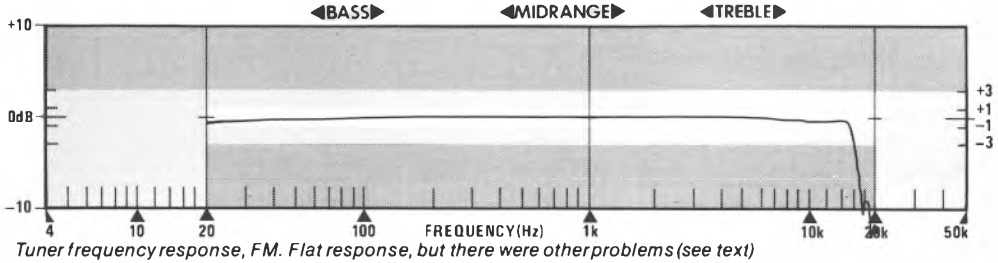
GENERAL

Rack dimensions	111cm x 51cm x 46cm
Speaker dimensions	61cm x 36cm x 28cm
Price	including speakers, £649

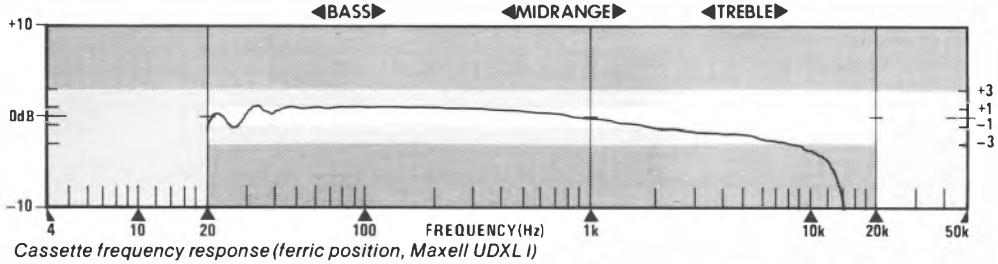




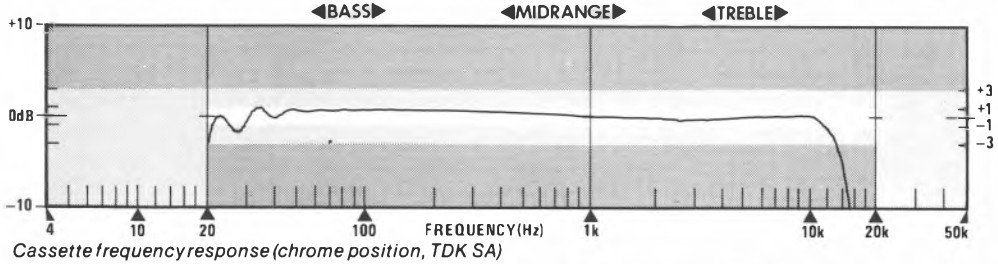
Disc frequency response. Treble response rolls off excessively (see text)



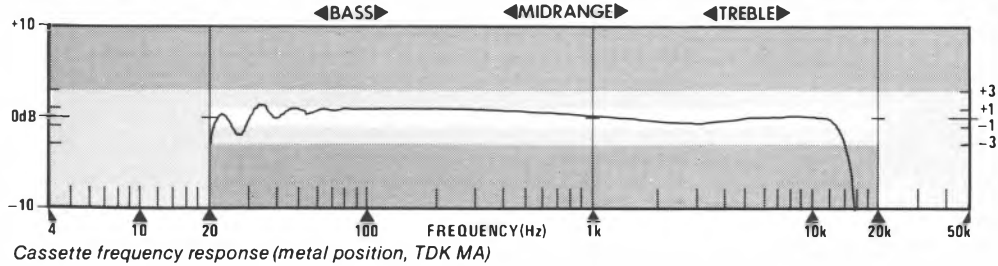
Tuner frequency response, FM. Flat response, but there were other problems (see text)



Cassette frequency response (ferric position, Maxell UDXL I)



Cassette frequency response (chrome position, TDK SA)



Cassette frequency response (metal position, TDK MA)

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25 watts RMS 0.08% T.HD. L.E.D. Peak power indicator. Thin tape input, twin speaker output. Attractive slimline design. 430mm width.

£79.95

AKAI GXM50

GXM50 3-Head Cassette Deck. Super GX heads. Metal tape. Program search. W & F 0.14% frequency 25–21Khz. What Hi-Fi Guide Price (Jan.81) £230.

Hyper Fi Price **£119.95**

Technics SB3030

3-way speaker Sys. 75 watt hand. Walnut fin. 8" base unit 3" mid-range 1"super tweeter. Hyper-Fi exclusive

£69.95

AKAI

HYPER-FI SCOOP

AM-U04. D.C. Integrated Amplifier. 50 watts RMS (8 ohms) THD 0.008% Dual power supply. Elec. Speaker Selec. with protection circuits. 2 Tape inputs

Hyper Fi Price **£99.95**

ROTEL RP1000

Direct drive turntable. DC Motor Auto Stobe with speed control +4% glass fibre head shell W+F 0.03% What Hi-Fi GUIDE PRICE APRIL 81 £150

HYPER-FI PRICE **£69.95**

Fitted with FREE Ortofon F15 Mk.II original. Also supplied with ROTEL RMC7 moving coil cartridge £69.95 (worth £35)

ROTEL RMC 7

Moving coil cartridge. (Same as AT 30E) Frequ. response 15-25,000Hz. Channel separation. 25 D.B. tracking force. 1.4-2 grams. Nude ellip. diamond.

What Hi-Fi Guide Pr. 30-4-81 £35. HYPER-FI PRICE **£9.95**

AKAI GXF80BL

GXF80BL. 3 head 2 motor cassette deck. Super GX heads solenoid logic controls. W&F 0.09% frequency 25–21Khz. S/N ratio 62D.B. Prof. black finish. What Hi-Fi Guide Price (Jan.81) £300.

Hyper-Fi Price **£179.95**

DUAL CS 505

HYPER FI EXCLUSIVE

Dual CS505 improved fitted with Ortofon Ultra-Low Mass Cartridge. Highly acclaimed. Silver or Black finish available.

Hyper Fi Price **£69.95**

Technics ST Z11L

3 band stereo tuner. S/N 26DB Sensitivity 0.9M.V. Dimensions 430 x 86 x 289mm.

Hyper-Fi exclusive **£59.95**

ADC

1500 F.G. D.C. servo belt drive turntble. ret, fitted with A.D.C. Q.L.M.34 Mk.III What Hi-Fi Guide Price Sept.81 £70.00

HYPER-FI EXCLUSIVE **£49.95**

AKAI GXC4000D

GXC4000D. 3 Head Stereo Deck. GX Heads. 4 Track 2 Channel Stereo System. S.O.S. Mic Line Mixing. 2 Speed in black professional finish. In Stock NOW. Exclusive

Hyper Fi Price **£179.95**

AKAI GX 625

3 head, 3 motor Reel-Reel. 10½ reel capacity, 4 track GX heads 'Gtd. for Life'. Digital tape counter. Feather touch, wow & flutter 0.08%. Frequency response 30-26,000 S/N ratio 62 D.B.

HYPER-FI SCOOP

Hyper Fi Price **£299.95**

TOSHIBA ST 230

AM/FM Tuner. Air Check 1.7 MV Sensitivity. 42cm width. What Hi-Fi Guide Price (Oct.81) £102.00.

Hyper Fi Price **£49.95**

AKAI

HYPER-FI EXCLUSIVE

PRA04/PAW04 Pre-power amp. combination. PRA04 Stereo pre amplifier. M.C. input. 4 position loudness switch. PAW04 D.C. stereo power amplifier. 50 watts RMS THD 0.008%.S/N Ratio 115DB.

Hyper Fi Price **£129.95**

AKAI

HYPER FI EXCLUSIVE

PRA06/PAW06 Pre-power amp. combination. PRA06/PAW06 amp as described for PAW06. PAW06 D.C. Stereo power amplifier. Pulse locked power supply. Heat pipe radiation system. Electronic Speaker selec. 130watts RMS (8 ohm). S/N Ratio 115DB. T.H.D. 0.008%. (What Hi-Fi Guide Price Dec. 81 £480.)

Hyper Fi Price **£299.95**

AKAI

38 watts RMS. 8ohms both channs driven 20-20KHz. 2 speaker outputs. L.E.D. Power Indicators. Twin tape input F.M. muting.

HYPER-FI EXCLUSIVE **£99.95**

ADC

1600 D.D. Semi-Automatic Direct Drive Turntable. Direct Drive phase Lock Loop Motor A.L.T.1 Micro-Switch controlled Auto Return Arm. 6% Speed Variation Strobe Light. Fitted with A.D.C. QLM 36 Mk III Cartridge. What Hi-Fi Guide Price (Dec.81) £98.00 inc. cart.

HYPER-FI SCOOP

Hyper-Fi Price **£59.95**

Technics

Z11 System 25 Watt Output 3 Band Tuner

Free Delivery

Metal tape solenoid control, complete with belt drive turntable, magnetic cartridge 3 way speakers, deluxe rack, full length glass door.

Hyper Fi Price **£369.95**

CELESTION CS 5

Exp.version of Ditton 332 80 watts handling 10" base unit 5" mid-range,1" dome. Walnut or Black finish

HYPER-FI SCOOP

What Hi-Fi Guide Price March 81 £269.95.

£139.95

ROTEL

HYPER-FI EXCLUSIVE

RX1000L 40 watts RMS. F.M. F.E.T. Front end T.H.D. 0.06% Frequency response. 5-40K. F.M. Sensitivity 1.9M.V. 3 Waveband. Tape Dubbing. Twin Speaker Outputs. What Hi-Fi Guide Price (Dec. 81) £150.

Hyper Fi Price **£99.95**

HARMON KARDON

230E AM/FM Receiver. 30 watts output T.H.D. 0.05%. Square wave rise time 5 microseconds.

HYPER-FI SCOOP

Hyper-Fi Price **£59.95**

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SALE

PHONE FOR BETTER PRICES

AMPLIFIERS

AKAI
AMU11(20) £58.95
AMU22(25) £84.95
AMU33(43) £98.95
AMU56(55) £139.95

AUREX
SBA50(30) £144.95
SB 66 (Clean Drive) £139.95

HITACHI
HA 2700 £47.95
HA 3700 £49.95
HA 4700 £69.95

JVC
AS3(22) £49.95
AX1(30) £69.95
AX2(40SEA) £89.95
AX3(55) £119.95
AX4(60SEA) £159.95
AX5(70) £209.95
AX9(105) £499.95
A10X(25) £59.95
AX7(90) £299.95

MARANTZ
PM310 £69.95
PM350 £84.95
PM450 £99.95
PM550(65) £134.95
PM750(80) £174.95

PIONEER
A7 £269.95
A8 £329.95
A9 £389.95
SA 410(20) £49.95
SA420(20) £54.95
SA520(30) £89.95
SA620(45) £119.95
SA720(65) £119.95
A5(35) £139.95
A6(60) £199.95

ROTEL
RA 300(25) £54.95
RA 350(40) £78.95
RA 500(37) £68.95
RA 550(50) £87.95
RA 1000(45) £89.95
RA 1010(70) £137.95
RB 1000(70) £97.95
RC 1000(PRE) £97.95
RB 1010(100) £166.95
RC 1000(PRE) £117.95

OPTONICA
SM 4100(35) £99.95
SM 5100(45) £114.95
SM7100(65) £169.95
SO 9100(PRE) £169.95
SX 9100(80) £339.95

SANSUI
A5(25) £69.95
A7(45) £89.95
A9(65) £129.95
AUD5(65) £174.95
AUD7(80) £209.95
AUD 22(30) £109.95
AUD 33(40) £139.95

SONY
TAAX2(25) £89.95
TAAX3(35) £114.95
TAAX4(45) £134.95
TAAX5(55) £169.95
TAAX7(75) £219.95
TAF 35(40) £74.95
TAF 40(45) £99.95
TAF 45(50) £99.95
TA 242(20) £54.95
TA 343(30) £64.95
TAF 60(70) £119.95

TECHNICS
SUZ11(25) £79.95
SUZ22(36) £109.95
SU8077K(62) £199.95
SUV3(40) £119.95
SUV5/SUV5K (60) £139.95
SUV7K(80) £199.95
SUV9K(120) £299.95

TRIO
KA 300(30) £54.95
KA 400(40) £94.95
KA 405(45) £138.95
KA60(30) £87.95
KA80(40) £99.95

TUNERS

AKAI
ATK11L £59.95
ATK22L £79.95
ATK33L £84.95
ATS55L £158.95
ATS08 £169.95

AUREX
ST T50 £109.95
ST 10L £114.95
ST 55 £169.95

HITACHI
FT 4400 £108.95
FT 3400 £59.95

JVC
TX 1L £69.95
TX 2L £119.95
TX 3 £79.95
TX 6L £159.95
TX 10L £67.95

MARANTZ
ST 310 £64.95
ST 510 £149.95
ST 450 £99.95

OPTONICA
ST 3636 £69.95
ST 5100 £89.95
ST 9100 £379.95
ST 5200 £129.95

PIONEER
TX 6081 £49.95
F7 £149.95
F9 £189.95
TX520L £69.95
TX720L £139.95

ROTEL
RT 300 £54.95
RT 1000 £87.95

SANSUI
T5 £74.95
T7 £99.95
T9 £119.95
TUS 5 £119.95
TUS 7 £149.9[illegible]

TOSHIBA
ST225 £7[illegible]
ST230 £4[illegible]

SONY
STJX2L £72.95
STJX4L £119.95
STJX5L £139.95
STJ60 £109.95
ST 242L £54.95
ST A35L £69.95

TECHNICS
ST S2L £59.95
ST S4L £119.95
ST S4T/ST S4TK £149.95
ST S6K £179.95

TRIO
KT 400L £49.95
KT 60L £87.95
KT 413 £129.95

CASSEIVERS

PIONEER
RX10L £149.9[illegible]
RX30L £199[illegible]
RX70 [illegible]

SONY
X05(20) [illegible]
X07(30) [illegible]

RECEIVERS

AKAI
AAR30(40) £99.95
AAR21L(26) £119.95
AAR31L(38) £124.95

JVC
RS 55L(40) £174.95
RS 77(60 SEA) £239.95
RS11(25) £99.95
RS33L(40SEA) £149.95
R1XL £109.95

PIONEER
SX400L(20) £89.95
SX 600(20) £99.95
SX 700(40) £129.95
SX D5000(80) £299.95
SX D5000(80) £299.95
SX 980(80) £169.95
SX 1080(120) £229.95

ROTEL
RX 100(40) £134.95

SANSUI
R5L(25) £89.95
R7(45) £129.95
R992(30) £139.95
3900Z(40) £189.95
4900Z(55) £229.95
5900Z(75) £259.95

TECHNICS
SA 303L(40) £129.95
SA 313L £239.95
SA 515L £279.95

SONY
STR VX2L £119.95
STR VX3L £149.95
STR VX4L £229.95
STR 55L £259.95

TOSHIBA
SA 520(50) £99.95

TRIO
KR710L £109.95
KR720 £169.95
KR80L £194.95

CASSETTE DECKS

AKAI
CSM3 £59.95
CSM4 £79.95
CSF9 £84.95
CSM02 £79.95
GXM10 £89.95
GXM30 £99.95
GXM50 £129.95
CSF11 £109.95
GXF 80 £179.95
GXF 35 £159.95
GXF 33 (Auto R) £1[illegible]

AUREX
PCX6AD
PCX25AD
[illegible]

HITACHI
D22S[illegible]
DE25
D355
DE55
DE95

JVC
KDA 11 £69.95
KDA 33 £99.95
KDA 7 £229.95
KDA 66 £219.[illegible]
KDD 35 [illegible]
KDD 4 [illegible]
DD 5 [illegible]
DD5 [illegible]
DD7 [illegible]
DD[illegible] [illegible]

OPTONICA
[illegible]
RT7100 [illegible]
RT7070 £239.95

MARANTZ
SD 1010/1015 £59.95
SD 5010 £189.95
SD 1030 £84.95
SD 2030 £119.95

PIONEER
CT 300 £89.95
CT 320 £84.95
CT 520 £99.95
CT 720 £169.95
CT 4 £114.95
CT 5 £159.95
CT6R £199.95
CT 7R £249.95
CT 8R £329.95
CT 9R £359.95

ROTEL
RD 18F £79.95
RD 1000 £166.95
RD 300 £79.95

SANSUI
D350M £179.95
D550M £214.95
D100M £99.95
D95M £69.95

SHARP
RT 10 £59.95
RT 3151 £99.95

SONY
TCFX2 £94.95
TCFX3 £99.95
TCFX5C £148.95
TCFX6C £179.95
TCFX7 £229.95

TEAC
CX 310 £59.95
CX 410 £149.95
A 108 SYNC £129.95
CX 350 £99.95

TECHNICS
RSM 215 £79.95
RSM 205 £74.95
RSM 225 £109.95
RSM 230 £139.95
RSM 250/RSM 250K £159.95
RSM 260 £179.95
RSM 65 £149.95
RSM 270K £219.95
RSM 280K £339.95

TOSHIBA
PC 230 £59.95
PCX 10 £59.95
PCX 12 £69.9[illegible]

TRIO
KX 400 [illegible]
KX 500 [illegible]
KX 600 [illegible]
KX 800 [illegible]

TURNTABLES

BSR [illegible]

MARANTZ
TT2200 £69.95
TT4000 £69.95
TT4200 £79.95
TT1200CT £49.95

OPTONICA
RP 5100 £109.95
RP 7100 £159.95

PIONEER
PL300 £84.95
PL2/PL120 £59.95
PL4/PL320 £84.95
PL6/PL620 £109.95
PL7/PL720 £139.95
PL8 £174.95

ROTEL
RP 310 £48.95

SANSUI
FRD3 £69.95
FRD 25S/Cart £64.95
FRD 35/Cart £84.95
FRD 45/Cart £128.95

SONY
PSLX2 £79.95
PSLX4 £94.95
PSLX5 £109.95
PSX55 £89.95
PSX65 £119.95
PSX76 £169.95

TRIO
KD 1500 £54.95
KD2070 £79.95
KD3100 £92.95

TECHNICS
SL8202 £64.95
SL B3 £84.95
SLD202 £84.95
SLD303 £99.95
SLQ202 £119.95
SLQ303 £134.95
SL 1800 £174.95
SL 10 £299.95
SL 7 £178.95
SLDL 1 £159.95
SLQL 1 £199.95
SL 1200 £179.95
SL 120 II £149.95

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AR28S £128.95
AR38S £168.95
AR BS £69.95
AR48S £229.95
AR92S £289.95

AKAI
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SWT 50 £159.95
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CASTLE
Clyde £69.94
Richmond II £99.94
Kendal II £149.94

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[illegible]ton 120 £57.95
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[illegible] £269.95
[illegible] £69.95
[illegible] £89.95

T.D.L.
Super C[illegible]

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[illegible]adance

JVC
SK 600 [illegible]

KEF
[illegible]

[illegible]
Pageli

SHORT
£89.95
£117.95
£174.95

PIONEER
CS353(30) £59.95
CS454(40) £69.95
CS656(60) £99.95
CS757(80) £149.95
HPM300(60) £129.95
HPM500(80) £179.95
HPM50(80) £164.95

RAM
Compact £84.95
CD 10 £104.95
CD 20 £134.95
6C £194.95
7C £244.95
80 £289.95
PMS 400 £649.95
LS 35/A £149.95

ROGERS
LS 35/A £179.95

SANSUI
ES 207 £147.95
ES 209 £169.96
J11 £69.95

TECHNICS
SB 3030 £69.95
SBR3 £149.95
SBR4 £198.95
SB3050 £99.95

TENSAI
TS 9040 £99.95
TS 1000 £199.95
TS 9035 £79.95

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T115 Cambridge £119.95
T125 Oxford £139.95
T145 Ascot £199.95
T165 Chester £199.95
T185 Dorset £249.95
T225 Mayfair £249.95
Cheviot II £399.95

Berkeley II £499.95
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Windsor £1299.95
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TANGENT
Excelsior £69.94
SPL1 £69.84
TM3 £109.94
XLR2 £149.94

WHARFDALE
Laser 40 £64.95
Laser 60 £79.95
Laser 80 £99.95
Laser 100 £129.95
Laser 200 £148.85
Laser 400 £189.95
E20 £139.95
E30 £174.95
E50 £268.95
E70 £314.95
90 £449.95

REEL REEL

AKAI
GX 625 £209.95
GX 4000 DBL £179.95

PIONEER
RT 707 £399.95

SONY
TC 399 £219.95

TEAC
X7 £339.95
X3 £289.95
3440 £749.95

EQUALIZERS

AKAI
EA G40 £99.95
EA G80 £149.95

ADC
SS1 IC £54.95
SS2 IC £149.9[illegible]
SS3 IC £219[illegible]
SS10 IC [illegible]

JVC
SEA 20GL [illegible]
SEA 50 [illegible]
SEA [illegible] [illegible]

MARANTZ
£87.95
£99.95

PIONEER
£84.95

ROTEL
RE 700 £67.95
RE 500 £67.95
RE 1010 £87.95

SANSUI
SE5 £99.95
RG7 £94.95

TECHNICS
SH 8020 £179.95
SH8015/8015K £99.95
SH8030 £189.95

TRIO
GE 80 £79.95

RACK SYSTEM

AKAI
PRO 1011W £319.95
PRO 1022W £399.95
PRO 1033W £494.95
PRO 1055W £584.95
PRO 3033 £789.95
PRO 2011 £589.95
PRO 921 £279.95
PRO 931 £359.95

AUREX
System 40 £399.95
System S £439.95

HITACHI
FULL RANGE P.O.A.

JVC
G10 £299.95
GR100 £289.95
GR303 £344.95
GX100 £529.95
GX200 £509.95
GX400 £699.95

MARANTZ
Mod 310/VR100 £359.95
Mod 350/VR250 £459.95
Mod 450/VR200 £699.95

OPTONICA
5100 System £549.95
7100 System £849.95
9100 System £1799.95
4100 System £449.95

PANASONIC
SG 240 £309.95

SG 166 £398.95
2800 £329.95

PIONEER
X 300(No L/S) £269.95
X 330(No L/S) £289.95
X 550(No L/S) £360.95
X 770(No L/S) £479.95
X 990(No L/S) £569.95
XR110 " " £279.95
XR210 " " £329.95
XR310 " " £379.95

ROTEL
A1000 £399.95

SANSUI
4000(No L/S) £324.95
5000(No L/S) £349.95
6000(No L/S) £379.95
7000A(No L/S) £469.95
8000(No L/S) £519.95
9000A(No L/S) £739.95

SANYO
V20 £299.95
H20 £349.95
V30 £449.95
V35 £769.95
V55 £949.95

SHARP
SG1E/SY1HX £179.95

SONY
FULL RANGE P.O.A.
ZR1/SSE34 £389.95
Z1/SSE34 £429.95
Z2/SSE44 £519.95
S80/SSE5011 £839.95

TECHNICS
Z22 System [illegible]
80 System [illegible]
Z11 System [illegible]

TRIO
335 [illegible]
£249.95
£364.95
£369.95
£494.95
£519.95
1000 R £934.95

MUSIC CENTRES

HITACHI
FULL RANGE P.O.A.

JVC
MF 33L £209.95
MF 55LS £349.95

PANASONIC
SG 2200 £169.95
SG 2110 £144.95
SG 2220 £219.95
SG 3220 £279.95

SANYO
FULL RANGE P.O.A.

SHARP
SG170/CP160 £129.95
SG270/CP270 £189.95

SONY
HMK 7000 £429.95
HMK 9000 £639.95
HMK 3000/SS115 £199.95
HMK 5000/ESS20 £299.95

TOSHIBA
SM2770/L/S £149.95
SM2950/L/S £218.95
SM3180/L/S £224.95
SM3350/L/S £239.95
SM3650/L/S £288.95
SMD30/L/S £299.95
SM4750 £369.95

MICRO SYSTEMS

AUREX
System 10 £299.95
System 12 £449.95
System 15 £899.95

AKAI
UC5 £689.95
UC3 £279.95

AIWA
M101 £239.95
M302 (3pc+L/S) 20w) £239.95
M301 (4pc No L/S 35w) £299.95
6065 £329.95
M606F £349.95
M505 £268.95
M502(50R) £279.95
M501(4 pc No L/S 50w) £449.95

HITACHI
ACT 02 £289.95

JVC
PC5L £269.95
E5 £529.95

ROTEL
FULL RANGE P.O.A.

TECHNICS
Mini System (3pc.)
SUC04/STC04L/RSM07 £398.95

SANYO
Micro £249.95

CARTRIDGES

ADC
QLM 32 £9.95
QLM 34 £10.45
QLM 36 £16.95
VLM £24.45
XLM £22.95
ZLM £55.95

AUDIO TECHNICA
AT 10 £8.95
AT 12 XE £17.95
AT 130 XE £27.95
AT 30 E M/C £34.95
AT 32 M/C £84.95

AUREX
C400/Z1000 £189.95

GOLDRING
G900 IGC/ADC
H/SHELL £48.95

GRADO
FTE+1/ADC £10.95
FCE+1/ADC £13.50
F3E/ADC £16.95
F2/ADC £27.95
F1/ADC £39.95

ORTOFON
FF15EO £11.95
F15E £16.95
VMS20II £24.95
M.C.A. 76 £49.95
VMS 10II/ADC H/S £18.95
VMS5/H/Shell £19.95

SHURE
M75 ED £13.45
M95 ED £18.95
M44G £7.95
M91 GD £7.95
M91E £14.95
M93E £9.95
M97 HE £32.95
M97 HEAH £34.95

VIDEO RECORDERS

AKAI
VS 5EK £589.95
VS 5EG £639.95
VS 10EK/EG £698.95

PANASONIC
NV7200 EK £629.95
2000VHS £499.95
NV3000B/NVV300B £699.95

JVC
WV 3200E £549.95
WV 3000E £399.95
WV 2600E £369.95
HR7700VHS £699.95
HR2200/TU22 £689.95
GX33 £318.95
GX88 £449.95
HR7200EK £499.95
HR 7300 EK £549.95

SANYO
9300 BETA £359.95

SONY
SLC5 £449.95
SLC7 £598.95
C7E P.O.A.
SL3000UB/TT3000UB £699.95
H.V.C.2000P £514.95
AG16
BETASTACK £88.95

TOSHIBA
V8600B £599.95

ACCESSORIES

A.D.C.
LMG1 £4.95
SLM300 £24.95

AKAI
DT 100 Timer £44.95
MM 626 Line Mixer £139.95

AUREX
AD3 (Address) £49.95

PIONEER
DT 510 Timer £44.95

TECHNICS
SHF101 FM Wing Antenna £39.95
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CONCLUSIONS

At the outset of this project, with thirty-six systems comprising over one hundred and seventy boxed items having been delivered but as yet unpacked, it was hard not to think that the audible characteristics of many systems would prove to be as similar as their looks! The surprise came during both testing and auditioning when it became clear that the spread of performance was going to be wide indeed – and not bunched around 'average' or 'mediocre'. The good systems and well-designed individual items can take on 'separates' hi-fi on its own terms – though at the other end of the scale there is equipment of very limited hi-fi performance, equipment which is really a music centre in separate boxes.

Racks

Looking at the component costs of a typical rack system it becomes clear that the customer is paying about 10% of his budget for a chipboard rack (this figure seems to hold true whatever the cost of the system be it £300 or £750). That is 10% spent not on sound quality but on a piece of furniture that needs to be incorporated into the domestic scene.

From an appearance point of view the racks again covered a wide range from the hardboard and 'plasticky' vinyl variety to the tongued-and-grooved chipboard or metal-framed models with good imitation veneers. Leaving out the excellently finished Bang and Olufsen equipment, the only piece of real wood veneer we encountered in the whole of the thirty six reviews was on a scrap of packing piece marked 'not for assembly' in one of the rack boxes!

If the equipment you want is available separately it may be worthwhile looking around at the racks from various manufacturers to be able to choose one that fits stylistically and in terms of finish with your room. The better racks offer the convenience of remote headphone sockets or cassette trays and drawers.

Turntables

The turntable proved to be a weak point in the majority of the systems we tested. With the motor units themselves the problems seemed to be always due to 'value engineering', producing a plinth which was far too light, or made of materials which would promote rather than resist feedback. Even the heavier turntables were disadvantaged by the often ludicrously inadequate 'isolating' feet and the complete absence of any isolating sub-chassis for the platter and arm. The turntables which did have a decent plinth or some form of suspended sub-chassis did better than average on the feedback tests and tended to produce deeper, cleaner bass and crisper stereo imagery.

Much of the midband colouration encountered with turntables can be traced back to inadequate disc support or badly-damped platters and nearly every turntable (with the exception of the Pioneer PL 120, the Rotel RP400X and Technics SL7 models) could be audibly improved by replacing the fitted platter mat with a massier, flatter design. Though specialist glass and exotic synthetic rubber mats are available they do not provide a cost-effective improvement. The three mats which would offer a sonic improvement without costing the earth are the Osawa OM10 (£8.50), the Ariston mat (£10.90) and the Avon mat (£10.50).

Moving on to the arms fitted to rack system turntables, it is noticeable that the straight wand type low mass pickup arm has now almost completely displaced the older style of S-shaped arm. The older arms, though more massive and therefore incapable of being matched with the newest higher-compliance budget cartridges, did at least have strength on their side. The lower mass straight arms as a group do seem to show upper bass and lower midrange resonance problems which undoubtedly colour the sound.

A more worrying trend is that toward the omission of adjustment of tracking weight or bias force, taking away the user's option to fit a different cartridge. The Optonica RP-4100E turntable has no provision for adjusting bias force while the Panasonic SL-H304 turntable's counterbalance weight is a plastic moulding allowing only half a gram adjustment of tracking pressure with the fitted cartridge.

Among the system turntables with fitted cartridges there were a few surprisingly good performers. The Ortofon FF15E, when it appeared in a system with good electrical matching, gave excellent results as did the cartridges fitted in the B&O 7002 centre and the Technics SL7. The cartridge fitted in the rather disappointing Aiwa AP-D35K turntable as supplied with the 606 and RS2S systems proved to be an exceptionally good tracker.

There seems to be a lack of awareness or concern among manufacturers as to the mass/compliance and electrical matching characteristics of cartridges. Time and again we measured cartridges with frequency response problems in the treble caused by bad phono input matching, or found that cartridges were

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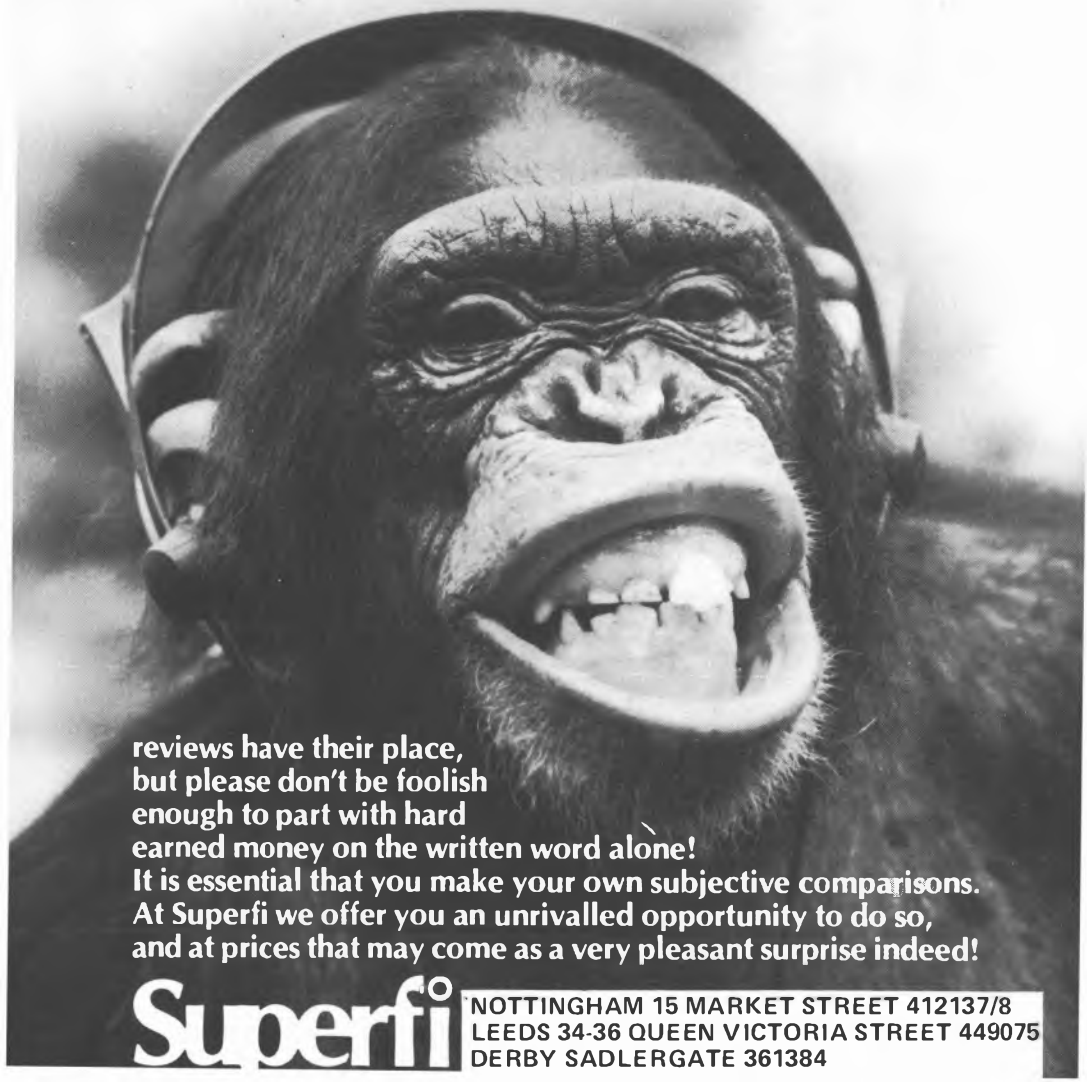

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too compliant for the arms with which they were matched.

A final surprise from the rack system turntables was to encounter a good number of 'OEM' cartridges from Audio-Technica using a one-piece moulded plastic cantilever. Though no separate measurements were conducted on this cartridge it does seem to have a tip mass resonance in the audio spectrum which causes a high frequency peak – the separation characteristic seemed less than ideal in the treble too.

Amplifiers

Though the amplifiers tested as part of the rack reviews didn't seem to suffer, as equivalent units did only a few years ago, from being unable to drive a reactive or 'difficult' loudspeaker load they did show an alarming tendency to be very inaccurately aligned. The phono input stages of some amplifiers deviated from the inverse RIAA curve by up to 5dB at the frequency extremes, to produce a tilted response, usually with rolled-up bass and bright treble.

That such simple circuitry is misaligned suggests that the manufacturers whose amps show this or similar frequency response problems are intentionally altering the sound balance of the equipment. From the measurements we took on samples supplied for review, Sony for instance would appear to prefer to market amplifiers with a curtailed low frequency response.

Hiss and hum problems were common enough in the amps of years ago, but we were surprised during this project to find amplifiers with bad circuit noise problems. The UK-produced HMV amplifier shows our own mass-market electronics industry to be very far behind Far Eastern design and manufacture in this aspect. GEC, the other British brand name represented, seem to have given up the unequal struggle against the Taiwanese and Korean electronics giants and are having their amplifier produced by 'the competition' as it were.

The German-produced Schneider receiver had an amplifier with a built-in bass boost of astonishing proportions – not only that, but this 'feature' is neither mentioned in the accompanying literature nor can it be switched off. Strictly, this makes the term hi-fi inapplicable to this model.

On the plus side, the price of power seems still to be steadily coming down with many of the amps offering good medium power of around 50 watts for a very fair price. Manufacturers are beginning to offer better switching input and tape dubbing facilities on their amplifiers too though many of the power meters were worse than useless and could have been replaced by a simple clipping-level LED indicator. Tone controls in general are designed with far too much cut and boost with curves that act too far back into the midband. Filter circuits too are designed with easy-to-produce shallow slopes and far too often affect much wider bands than the frequency extremes they are designed to attentuate. Thus many of the 'lo' filters or subsonic filters take out fundamental bass power while scratch filters severely pull down treble. The common loudness button too seems only to offer a fixed level of bass and treble lift which can be obtained with the tone controls anyway.

Tuners

With a few exceptions, the tuners in the rack systems we tested performed well. Tuner circuitry is now based largely on standardised ICs, and consequently cases of bad design and factory misalignment are few.

Digitally synthesised tuners do seem to take use of this technology to an inconvenient extreme and sometimes the simple 'analogue' tuners offer easier tuning though they lack the convenience of presets. In one case we found the synthesiser circuitry to be adversely affecting the noise performance of the finished tuner – this is certainly something that shouldn't be allowed to occur.

Centre tune LEDs or meters and signal-strength indicators seemed with very few exceptions to be singularly badly designed. Signal-strength meters were no help in determining the signal strength required for minimum noise performance of stereo FM and more often than not lit across their scale with the smallest aerial signal. The level at which the interstation mute threshold was set seemed to be badly chosen in some models. It was good to see one manufacturer, Teac, intentionally produce a tuner set up specifically for low-distortion reception of 'local' transmitters rather than produce a tuner of spec-manship paper performance on selectivity and other often misunderstood or irrelevant measurements.

A small group of tuners were not capable of being fed with a 75ohm unbalanced aerial feeder. To connect a 75ohm roof or loft aerial to 300ohm sockets requires a special matching balun – otherwise users must rely on the inadequate ribbon dipole aerial supplied with the set. Any tuner is only as good as the aerial which feeds it.

CONCLUSIONS

Cassette
Manufacturers seem to be frighteningly ignorant of the need to use a properly matched tape type with any cassette player. Absurdities in the makers' lists of recommended tape types we came across included a factory alignment tape (not designed for consumer use!), obsolete or unobtainable brands, and types whose electrical properties make them best regarded as mutually exclusive. For instance TDK AD and TDK D cannot both give a flat response on the same bias setting though they are both ferric tapes for use in the normal or 'Type I' position. A deck must work better with one or the other! Customers may therefore be unable to get the best performance out of their new cassette machine even by strictly following the manufacturers tape recommendations!

All but one of the cassette decks reviewed were metal-tape compatible, though many would achieve better results more cost-effectively with pseudo-chrome tape types.

Meters provided on many of the machines tested were far too slow-acting to give accurate indication that recording level peaks exceed the tape's headroom and thus produce distortion.

Many cassette decks ran fast or slow to an unacceptable degree, and other problems too seemed to stem more from inaccurate setting-up of machines during manufacture, rather than inherent design problems. Our advice would be therefore to pay to have your cassette deck aligned with one or two tape types in mind, as even budget machines can then be persuaded to produce very good results. The 'music scan' or 'programme search' facilities advertised by some manufacturers, and which appear so useful, proved to be less helpful in practice, as they are intended to be used on limited dynamic-range material with four-second or longer pauses between items.

Speakers
Speakers were generally the most disappointing aspect of the systems tested. Increasingly, manufacturers have tended to offer multi-way speakers with flashy looks, but very poor measured and heard performance. A good two-way design with a stout cabinet and simple but well-specified crossover would show up many of the three-way designs seen as part of these systems. Most of the speakers tested were fitted with large paper cone tweeters which both distort and roll off early. Crossovers were in many instances only there to protect the tweeter from low frequency signals or perhaps to compensate for treble level – very few cross-overs were found which made any real attempt to integrate the drivers and cabinet in any hi-fi sense. Sadly, the two speakers which come to mind as being of above-average build quality, the GEC and B&O models, both showed frequency response irregularities which seemed intentional on the part of the manufacturer.

Only the Aurex and Rotel mini systems, the Sanyo and Marantz 350 racks had speakers supplied which showed anything like hi-fi separates speaker performance. In nearly every other case the customer would almost be better advised to buy blind from one of the big UK speaker producers – Celestion, KEF, B&W or Wharfedale.

Alternatives
On the showing of the thirty six systems in this edition of *Choice,* there are very few one-make rack systems which compete with the budget separates we used as our reference equipment (Dual CS505 turntable with Nagaoka MP-11 cartridge, NAD 3020 amplifier and KEF Coda II loudspeakers). It was interesting to see that the most competitive among our review samples were the miniature system which do as a group seem to be better designs, or at least more recent designs than much of the large rack equipment – the catch with the minis is that they still tend to be more expensive than a similarly-specified full-sized rack.

Rack systems were the natural successors to the music centres in a market that was becoming more experienced and critical about sound quality. But the world-wide recession has now pushed manufacturers into cost-cutting design, but without sacrificing the visible features which make hi-fi saleable. As a result, equipment with little sonic distinction seem to be the means to stay afloat for many manufacturers – at least until the digital Compact disc player and video-disc player waves break together to herald the end of the rack and the start of the mega-music centre. But that may be in the 1990s!

Aknowledgements
We would like to thank AT Labs Ltd., of Chase Side, Enfield, Middx., and Studio 99 Ltd., of Fairfax Road, London NW6, for the loan of Pioneer and Technics equipment used in our reviews.

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BEST BUYS AND RECOMMENDATIONS

It was clear once the reviews had been assembled that the Best Buys were going to come from among the cheaper systems. The candidates were reduced to a handful by the poor showing of systems where part of the budget went on a pair of visually-attractive but sonically disappointing speakers. None of the £320 speaker-inclusive systems, we felt, put in a strong enough all-round performance to be considered as Best Buys.

Assuming that around £75 would be spent on completing the system with a good pair of speakers, our Best Buys all cost between £350 and £450. Above this price the consumer's cash seems to go on facilities and gimmicks rather than audible improvements.

Though the systems we reviewed reached the £900 price bracket it was felt in these cases that impeccable design and finish couldn't justify recommendation if combined with sound quality similar to the best under-£400 systems.

Our value judgements are based on the prices we have quoted, which should be typical at the time of going to press. If you can find a Best Buy or Recommended product for less than the price we quote you have found a bargain but do beware of inclusive system prices – check just what is included in the way of rack, speakers and cartridge, as well as the electronics line-up. Please note that prices we have quoted refer to the rack as shown in our photographs – alternatives may be available and this will affect the system price. If in doubt, check the rack model number, quoted in each review.

Best Buys

The **Dual System 2** (£379 excluding speakers) was a consistent performer on all tests, and a high quality performer too. There was no serious weakness in the system as it stands and this equipment could be matched to a fine cartridge and a pair of quality speakers to produce a rack system capable of being compared with the better separates systems at a similar inclusive price. For the record enthusiast the Dual system offers one of the finest disc sounds we tested while the above-average build quality of both equipment and rack went towards justifying its price.

The **JVC GR100** receiver-based system (£289 without speakers) avoided the typical receiver pitfalls of below average-power output or second-rate tuner performance. The neat finish and stout rack went towards making this system a Best Buy – as did the fair disc system performance even with the fitted cartridge, the excellent tuner sound quality and the good ferric tape record/replay performance and flat replay-only response from the cassette section. A consistent performer which will give above-average results straight out of the box with a pair of even modest loudspeakers.

The **Pioneer X330T** system (£320 without speakers) provided better disc replay than the JVC and in the PL120 has a turntable to rival the Dual. The X330 equipment can be obtained for less than our quoted price by opting for the short rack, which will knock £20 off. The amplifier was not one of the most powerful tested in a £320 system, though it was capable of driving low-impedance loads which means that efficient 4ohm speakers could be used with the X330 system to produce above average levels if required. The tuner and cassette deck offered good sound quality. The cassette deck was badly aligned at the start of our tests, though as this system was supplied by a shop, we have given the manufacturers the benefit of the doubt here.

Recommendations

The **Aiwa RS2S** (£440 without speakers) was let down only in the turntable section, as both the tuner and cassette deck were capable of exceptionally good results. The tuner carries power sockets which enables the system to be run from one mains plug and switched on together, while the pre-production sample of the rack supplied was of above average build quality.

The **JVC GX 200/II** (£589 excluding speakers) provides our other recommendation from among the speaker-less systems. The GX200 also leaves the choice of cartridge to the buyer and with the prices of these on top of its already high price its performance had to be significantly above its group average to gain a recommendation.

The **Marantz Module 350** (£449 including speakers) was something of an odd-man-out in gaining its recommendation mainly on the strength of the supplied speakers – which were one of the very few models tested that proved comparable with similarly-priced hi-fi designs sold separately. The turntable section of the Marantz 350 was significantly below par as supplied but as we go to press it does appear that some TT2200 turntables are becoming available fitted with an alternative to the cartridge that caused problems for us. The cassette deck of the 350 system had poor distortion figures but subjectively offered fair sound. The strengths of the amplifier, speakers

and tuner have pulled this system through to Recommended status.

The **Rotel A400 system** (£320 including speakers) suffered from an electrical input mismatch between the cartridge and amplifier, and from a pair of speakers with performance well below the standard set by rack system speakers let alone hi-fi models. The tuner proved impressive during auditioning the cassette deck too was very capable on the record/replay tests though less good on pre-recorded cassette replay, while the amp proved capable with low inductance cartridges. A fair all-round performance as the system stands but with a suitable cartridge and better speakers the Rotel A400 could be very competitive.

The **Sansui 1100** (£318 including speakers) found itself in the same boat as the Rotel with a poor cartridge match – this time a model which is too compliant for the arm rather than electrically mismatched – and a pair of uninspiring speakers. The Sansui receiver offered clean sound on disc with nominal 8ohm speakers, though lower-impedance designs are not ideally suited. The cassette deck was both easy to use and capable of making fine recordings – though again less successful with pre-recorded cassette replay. The turntable's potential could be realised with a better headshell and a lower compliance cartridge. Good equipment design and finish are coupled with a stylish, if inconvenient, rack.

The **Sanyo 3030** (£400 including speakers) was one of the few speaker-inclusive systems to have a pair of acceptable loudspeakers supplied. Our recommendation is based on the fact that this equipment can give a consistent performance from any input from day one of ownership without recourse to immediate upgrading of speakers or cartridge. Only mediocre pre-recorded-cassette replay spoiled the system's overall performance.

The **Teac Ace 7D** system (£649 including speakers) proved hard to categorise. The system incorporates a good turntable with a low mass arm, leaving the choice of cartridge to the customer. The amplifier is equipped with an excellent input selector which allows monitoring of one input while taping another. The tuner measured and sounded well offering low-distortion local reception of high quality, rather than being designed for long range reception. The tuner has no longwave reception. Though compatible only with high-bias high performance tapes in each tape matching position the cassette deck was capable of excellent record/replay results while pre-recorded cassette replay was considered good. The speakers and chrome stands supplied as part of the 7D system only succeeded in pulling down the performance of the rest of the equipment. Had the electronics and turntable been supplied as the cheaper 7L10 system with conventional rack and no speakers the performance would have undoubtedly merited Best Buy status. For once, styling 'trimmings' have been added to basically fine equipment.

Recommended 'minis'

The two final recommended systems are both mini systems though of quite different specification and appeal.

The **Aurex Micro System 10B** (£289 with speakers, no turntable) does not include a record deck but only tuner, amp, cassette deck and speakers. The amplifier could be a little underpowered for some applications while the phono input electrical characteristic requires careful cartridge matching. Nevertheless with the miniature SS-M2 speakers the combination proved to be a good match. Both tuner and cassette deck offer fair sound quality though the overspeed replay may limit the enjoyment of pre-recorded cassette material for some listeners. Stylish design, true micro dimensions and the provision of a fair pair of speakers for an astonishingly low price help the Aurex 10B gain recommendation.

The **Technics Mini Serie** (£580 without speakers) is more sophisticated than the Aurex System 10 and includes a true miniature ('jacket size') turntable – which provided the finest disc sounds heard during this project. The small size, full automation and freedom even to use the turntable on its end, coupled with its fine sound makes the SL7 one of the most interesting products in the whole review section. The matching amp and cassette deck were both good performers, with the deck's auto tape sensing offering convenience for the forgetful or uninitiated user. The available samples of the tuner however suffered a noise problem – and this alone stood in the way of the Mini Serie system receiving a Best Buy status.

Worth considering

At the top of the 'worth considering' list come the two remaining mini systems, which for various reasons just missed being 'recommended'.

The **Aiwa System 606** (£455 including speakers, no turntable) mixes a UK-built digital

tuner capable of the finest sound quality with a Japanese cassette player which fell short of the mark on pre-recorded cassette replay, by running fast. The amp sounded fair and was well provided with facilities. The Japanese speakers were disappointing on audition and Aiwa's suggested turntable (as supplied with the RS2S system) brought the standard of disc reproduction down below that of the other sources. The electronics however with better ancilliary equipment are genuinely worth considering.

The **Rotel Micro 90** (£499 including speakers, no turntable) can be had for £100 less without the remote control unit. But on balance we had to withhold a Recommendation from the package as reviewed. A competent tuner is matched with a fair amplifier of medium power output and a cassette deck of better performing standard on pre-recorded material than on record/replay, along with the smooth though small-sounding speakers for around £400. All the Rotel equipment is available for purchase separately though the cassette deck needs the amplifier for its low-voltage power supply.

The **Hitachi 2800VS** (£349 including speakers) is one of three conventional-size systems 'worth considering'. It was reviewed with an obsolete cassette deck which has now been replaced by a newly-styled similarly performing model included at the same quoted system price. The speakers in combination with the fitted cartridge in the turntable proved very fatiguing to our ears though the performance could be improved by fitting a 'smoother' cartridge.

The **Marantz Module 310** (£350 including speakers) put up a poor showing simply because of the very bad arm/cartridge interactions and the poor sound of the supplied speakers, though they are in reality no worse than many rack system speakers. The amplifier and tuner were excellent performers, though the cassette deck's measured and heard results fell below this standard, it was fair at this price. The turntable has the potential to be improved cheaply and it does now seem that not all these TT1200 turntables are fitted with the problematic Excel cartridges but with Audio-Technica-produced models. Marantz make a point of offering their systems in combinations other than those reviewed – the Module 310 electronics can for instance be matched with a pair of the HD445 speakers, which pulled the performance of the Module 350 system up to the Recommended bracket.

The **Trio V30** (£349 including speakers) was a little overpriced to compete squarely with the other products of similar performance – which tended to sell at around £320. With a good quality cartridge fitted, the disc section starts off ahead, though problems were discovered with the turntable motor unit. The electronics performed well but the system was let down by the speakers.

Finally, mention should be made of five other systems which made a good showing in one area or another but which cannot command overall recommendation.

The **Akai Pro 1011** (£359 including speakers) had a poor cartridge fitted though the non-standard headshell restricts improvements to the arm's performance; the speakers too were badly integrated. The tuner and cassette deck could produce fair sound quality though limits were put on their performance by the amp's hiss problem. Nevertheless the system's potential could be achieved if quality control were tightened up as the basics seem to be all there. The **GEC A3000** system (£340 including speakers) includes a remarkable amount of material for the price though the amplifier suffered from bad hiss and the tuner will work properly only with good aerial installations. The **Mitsubishi System 3** (£492 including speakers) was uncompetitively priced though its problems seemed to lie in frequency response irregularities rather than any basic design faults. The speakers however were badly coloured and produced a very unhappy combination with the supplied cartridge. Sansui's remote control system, the **Sansui 9900** (£870 including speakers), offered good sound from tuner and cassette – but though the record deck was provided with track selection automation, the fitted cartridge was not very good. The speakers were unacceptably coloured though capable of high level replay. The basic equipment in this gimmicky system is of good quality. The **Tensai Slimline** System (£470 including speakers) included an excellent quality tuner though the cassette sound was poor and the disc/speaker combination badly coloured while the amp had noise problems – again this system seemed victim of poor quality control.

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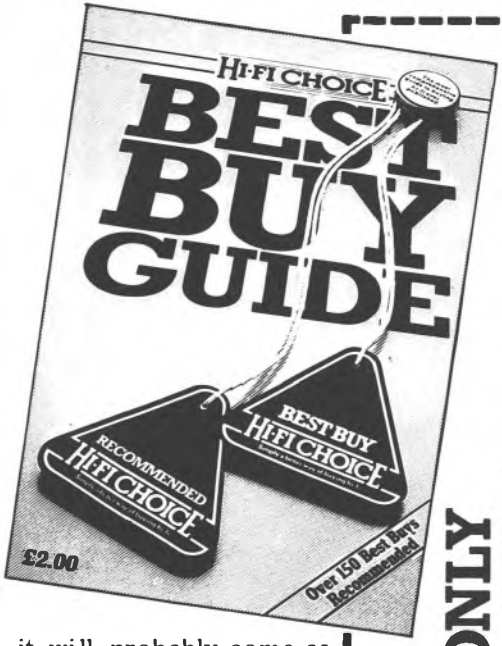

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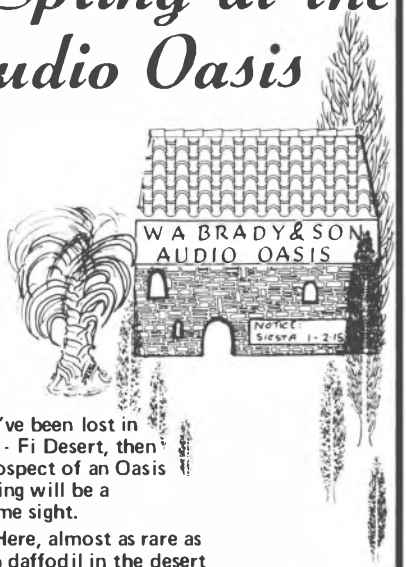

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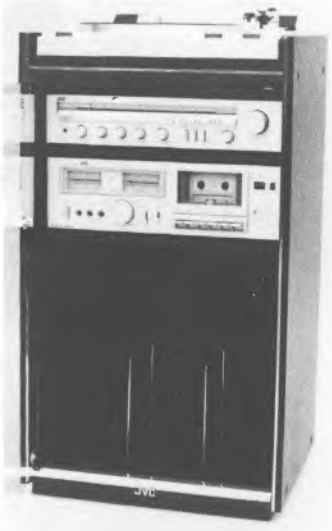

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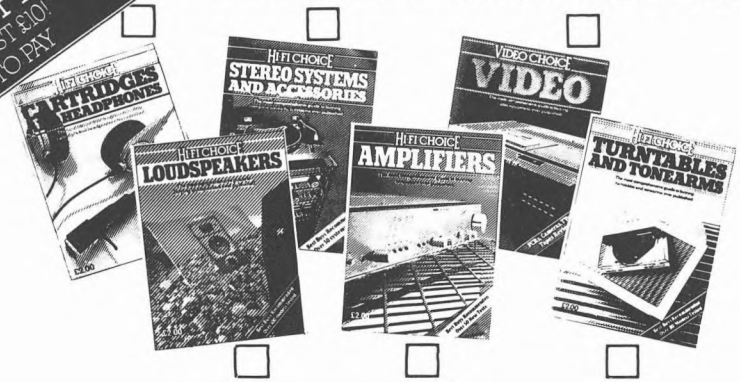

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COMPARISON CHART: FACILITIES

SYSTEM	Price including speakers	TURNTABLE				AMPLIFIER											
		Auto start	Auto-repeat	Disc sensing	Variable speed	Moving-coil input	Second tape input	Mic mixing	Bass and treble controls	Midrange control	Equaliser	Loudness	High filter	Low filter	Mono switch	Power meters	Second speaker outlets
Aiwa RS2S	440					■	A		■			■		■	■	■	■
Aiwa 606 (mini)	455	Not incl. in price				■			■			■		■		■	
Akai Pro 1011	359								■			■			■	■	
Aurex Micro 10B	289	Not incl. in price						■	■			■					
Aurex System 40	449						■		■			■			■	■	■
B&O Beocenter 7002	895	■		■			■		■			■					■
Dual System 2	—				■		■		■			■					
Fisher 350	—	■	■				■		■			■		■	■	■	■
GEC A3000	340				■				■			■					
Hitachi 2800VS	330						B		■			■		■		■	■
Hitachi 4800	—					■	■		■			■		■		■	
HMV 8000H	492				■				■			■	■	■	■	■	■
Inkel Remote Control	440				■				■			■					
JVC GR100	—						C		■			■					■
JVC GX200 MkII	—	■	■		■		■				■				■	■	■
Marantz 310	350								■			■		■		■	
Marantz 350	449				■				■	■		■		■		■	■
Mitsubishi System 3	492						■		■			■	■	■		■	■
Optonica 4100	499	■					D		■					■	■		■
Panasonic 2800	359						■		■			■				■	■
Philips 112	299								■			■					■
Pioneer X330	—								■			■					■
Rotel A400	320								■			■				■	■
Rotel Micro 90	499	■	■		■				■			■				■	■
Sansui 1100	318				■				■			■					■
Sansui 9900	870	■	■	■	■	■	■		■			■	■			■	■
Sanyo 3030	400				■				■			■	■			■	■
Schneider Team 201	419				■							E					
Sony ZR1	369								■			■					■
Sony S80	789	■	■	■					■			F				■	■
Teac Ace 7D	649	■	■		■	■	■	■	■			■		■	■	■	■
Technics Mini Serie	—	■	■	■			■		■			■					■
Tensai Slimline	470				■		■	■	■	■		■	■	■	■	■	■
Toshiba System 25	400							■	■			■				■	
Trio V30	349								■			■					■
Trio V70X	649				■		■		■			■		■	■	■	■

Notes: (A) *Tape 2 is play only. 'Aux' inputs provided.* (B) *No tape 2 sockets, no 'aux' inputs either.* (C) *Tape 2 is play only. No 'aux' inputs provided.* (D) *'Aux' inputs provided with 'tape 2 to tape 1' dubbing.* (E) *Volume control has built-in bass boost.*

COMPARISON CHART: FACILITIES

TUNER							CASSETTE DECK										
Medium wave	Long wave	FM presets	AM presets	Digital readout	Auto scan tuning	Signal-strength meter	Mic input	Light-touch controls	Programme search	Real-time tape counter	Auto-repeat play	Counter memory	Auto-play	Timer-compatible	Peak-level indication	Variable output	SYSTEM
		6	6													J	Aiwa RS2S
		10								K							Aiwa 606 (mini)
																	Akai Pro 1011
							I										Aurex Micro 10B
																	Aurex System 40
		5	1														B&O Beocenter 7002
																	Dual System 2
		6	6														Fisher 350
																	GEC A3000
						G											Hitachi 2800VS
		6	6														Hitachi 4800
																	HMV 8000H
		7	7														Inkel Remote Control
																	JVC GR100
		7	7														JVC GX200 MkII
																	Marantz 310
																	Marantz 350
		7	H														Mitsubishi System 3
		10	H														Optonica 4100
																	Panasonic 2800
																	Philips 112
																	Pioneer X330
																	Rotel A400
		5	5														Rotel Micro 90
																	Sansui 1100
		6	6														Sansui 9900
		8															Sanyo 3030
		9															Schneider Team 201
																	Sony ZR1
		7	7														Sony S80
		5	5														Teac Ace 7D
		6	6														Technics Mini Series
																	Tensai Slimline
																	Toshiba System 25
																	Trio V30
																	Trio V70X

(F) *Sound enhancer' controls.* (G) *'Vector tune' indicator.* (H) *Presets can be used for AM stations.* (I) *On back panel.* (J) *Fine bias adjustment.* (K) *Only with AT-50 timer unit.*

COMPARISON CHART: PERFORMANCE

	TURNTABLE					TUNER			
	Frequency response	*Distortion*	*Tracking ability*	*Hum and rumble*	*Speed variation*	*Frequency response*	*Stereo separation*	*Distortion*	*Noise*
Aiwa RS2S	average +	average –	excellent	v. good	v. good	v. good	excellent	good	good
Aiwa 606 (mini)	*Turntable not included in price*					v. good	excellent	average –	v. good
Akai Pro 1011	average	average +	good	average	v. good	v. good	excellent	v. good	average
Aurex Micro 10B	*Turntable not included in price*					average +	good	poor	v. good
Aurex System 40	v. poor	excellent	good	v. poor	good	poor	v. good	poor	average
B&O Beocenter 7002	v. poor	average +	good	v. good	average +	average +	excellent	average	good
Dual System 2	v. good	average –	good	good	average	average	v. good	good	good
Fisher 350	v. poor	average +	good	good	v. good	v. good	excellent	v. good	excellent
GEC A3000	average –	average	good	average	excellent	average +	v. good	average +	excellent
Hitachi 2800VS	good	average	good	good	good	v. good	v. good	average –	excellent
Hitachi 4800	average	average	good	v. good	v. good	v. good	v. good	average +	v. good
HMV 8000H	poor	average –	average	average –	v. good	average +	good	average	average +
Inkel Remote Control	excellent	average –	good	good	average –	good	excellent	average +	poor
JVC GR100	good	poor	good	good	average –	average –	v. good	average +	v. good
JVC GX200 Mk II	*Cartridge not included in price*			v. good	v. good	average	excellent	good	good
Marantz 310	v. poor	v. poor	poor	good	average +	v. good	v. good	average	v. good
Marantz 350	average +	v. poor	poor	good	v. good	good	v. good	good	good
Mitsubishi System 3	average	good	good	good	v. good	v. poor	v. good	average +	v. good
Optonica 4100	average +	average +	good	good	average –	v. poor	excellent	average +	v. good
Panasonic 2800	poor	v. poor	poor	excellent	good	average +	excellent	excellent	v. good
Philips 112	v. good	v. good	good	average	average +	excellent	v. good	v. poor	average
Pioneer X330	v. poor	excellent	excellent	v. good	v. good	average –	excellent	v. good	excellent
Rotel A400	*see text*	average	average	v. good	average +	excellent	v. good	average	excellent
Rotel Micro 90	*Turntable not included in price*					average +	excellent	good	average +
Sansui 1100	v. poor	average	excellent	good	average –	excellent	v. good	average +	good
Sansui 9900	average	good	excellent	average	excellent	average	good	v. good	good
Sanyo 3030	average +	excellent	average	good	average +	v. good	v. good	v. poor	average
Schneider Team 201	*see text*	v. good	excellent	average –	v. poor	*see text*	v. good	average +	average
Sony ZR1	v. poor	average	excellent	average	excellent	v. good	v. good	average	v. good
Sony S80	poor	poor	excellent	good	v. good	good	excellent	good	v. good
Teac Ace 7D	*Cartridge not included in price*			v. good	excellent	v. poor	v. good	excellent	v. good
Technics Mini Serie	excellent	poor	excellent	good	excellent	v. good	excellent	excellent	v. poor
Tensai Slimline	average –	average	average	average	v. good	v. good	v. good	excellent	average
Toshiba System 25	average –	excellent	good	good	average –	v. good	good	v. poor	v. good
Trio V30	good	good	average	good	average –	average +	v. good	good	good
Trio V70X	*see text*	average –	good	good	good	average +	v. good	average	v. poor

Please note: *This table gives our value judgements based on some of the measured test results, which are quoted in full in each review. 'See text' indicates a result demanding fuller explanation, which is given in the review. While these results give a guide to overall performance, they should be looked at in the context of the reviewers' comments.*

COMPARISON CHART: PERFORMANCE

CASSETTE DECK								VALUE JUDGEMENT
Ferric position		*Chrome position*		*Metal position*	*General performance*			
Frequency response	*Replay only response*	*Frequency response*	*Replay only response*	*Frequency response*	*Noise*	*Distortion*	*Speed variation*	
average +	good	average +	good	good	good	average –	excellent	Recommended
average +	v. good	good	v. good	good	typical	average +	excellent	Worth considering
average	poor	average +	poor	good	typical	average –	good	
poor	average +	average	good	v. poor	typical	average +	average +	Recommended
average –	poor	average –	poor	good	typical	average –	average –	
good	excellent	good	*see text*	good	good	poor	excellent	
average	v. good	average –	v. good	good	v. good	average –	v. good	Best buy
v. poor	excellent	average +	excellent	v. poor	typical	excellent	poor	
average +	excellent	average +	excellent	—	v. good	poor	average +	
poor	excellent	v. poor	average	average	typical	v. poor	v. good	Worth considering
poor	excellent	v. good	excellent	v. good	good	poor	good	
average –	good	good	good	v. poor	typical	v. poor	excellent	
poor	*see text*	v. good	*see text*	v. good	v. good	average –	v. good	
average +	excellent	average –	excellent	average +	typical	good	v. good	Best Buy
v. poor	excellent	average –	excellent	v. good	typical	good	average +	Recommended
average –	good	average +	good	good	typical	v. poor	v. good	Worth Considering
average –	good	average +	good	good	typical	v. poor	v. good	Recommended
good	average +	good	*see text*	average +	typical	average	excellent	
average +	excellent	average	excellent	good	good	average –	excellent	
average +	average	average +	average	average +	typical	average –	average	
average –	average	average +	average	average +	*see text*	v. poor	average +	
average +	see text	average –	*see text*	average +	typical	average	good	Best Buy
good	average	average	average	good	typical	*see text*	good	Recommended
average +	excellent	average +	excellent	good	*see text*	average –	v. good	Worth Considering
average	poor	average	poor	average	typical	average –	average –	Recommended
average	average	good	*see text*	good	*see text*	*see text*	average +	
average	*see text*	average	*see text*	average +	typical	good	good	Recommended
see text	*see text*	*see text*	*see text*	*see text*	good	good	average	
average	excellent	average	excellent	good	poor	good	v. good	
average	excellent	average +	excellent	v. good	average –	average –	excellent	
average +	v. good	average	excellent	average	excellent	poor	excellent	Recommended
average +	excellent	average +	*see text*	average +	typical	good	average +	Recommended
see text	good	average +	good	average +	typical	average +	average –	
good	v. poor	good	v. poor	good	typical	average	good	
good	excellent	good	excellent	good	typical	average –	good	Worth Considering
see text	excellent	good	excellent	good	typical	average	v. good	

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Alvin Gold, *Practical Hi Fi*, Sept. '81

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GLOSSARY

Acoustic breakthrough or feedback: In turntables, effect of vibration from the loudspeakers or other sources picked up microphonically by the cartridge. Symptoms range from subtle distortions to 'howl-round'.

Azimuth: In cassette decks, refers to accuracy of alignment of the head. The head gap should be at exactly 90° to the direction of tape travel. Maladjustment causes loss of treble on pre-recorded cassettes.

Bias: In tape decks, a high-frequency alternating current applied to the head during recording. For best performance bias must be adjusted to suit the tape being used.

Bias compensation: On turntables, an adjustable outward force acting on the arm to counteract the inward pull of the groove due to arm geometry. Also known as 'anti-skating'.

Cantilever: In a cartridge, the tiny tube or arm on which the stylus diamond is mounted.

Clipping: Heard as severe treble distortion, clipping is the truncation of the output waveform due to overloading an amplifier. Can occur when an under-powered amplifier is turned up full with large speakers.

Colouration: General term for audible effects of distortions, particularly in loudspeakers and record players, and usually those caused by frequency response irregularities and/or resonances.

Compliance: In cartridges, the springiness of the cantilever/stylus assembly in its movement relative to the cartridge body.

Decibel (dB): A unit of relative loudness, or relative strength of electrical signals. In general use for specifying sound pressure level (SPL), the figure given will be relative to the threshold of hearing. Thus 0dB is the threshold of hearing, 120dB 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'.

Distortion: Usually refers to 'total harmonic distortion' which is the percentage of uneanted frequency components (harmonics) present in a wanted signal. Strictly, distortion can mean any unwanted change in the signal, introduced by the equipment.

Dolby: Usually refers to Dolby B noise reduction, fitted to most cassette decks. The Dolby circuit boosts low-level trebel signals on record and cuts them again on replay, so that tape hiss is effectively reduced by 8 to 10dB. Dolby C is a further development giving even greater noise reduction.

Dynamic range: The range between the quietest and loudest sounds which a system or component is capable of reproducing.

Equalisation: Deliberate modification of frequency response. In disc and tape recording, equalisation is applied in a standardised way prior to recording (pre-emphasis) and this is compensated by inverse equalisation (de-emphasis) on replay.

Flutter: Rapid fluctuations of pitch, caused by cyclical changes in speed in tape deck or turntable.

Frequency response: Range of frequencies which a system can reproduce evenly, that is, without emphasising some notes or tones at the expense of others. Usually specified ± 1dB, as in our tests.

Hertz (Hz): Unit of frequency – 1Hz equals one cycle per second, 1kHz one thousand cycles per second.

Impedance: In loudspeakers, the electrical load presented to the amplifier. Though nominally specified as a single figure such as 8ohms, the actual load the amplifier has to drive varies with frequency.

Integration: Term to express the success with which drive units in a speaker are combined to give a smooth output through the crossover region.

Mistracking: Failure of the stylus to exactly follow the modulations in the record groove. Audible effects are mainly in the treble, producing harshness, rasping sounds or blurring of notes.

MPX filter: Filter which cuts out the 19kHz pilot tone used as part of the multiplex system in stereo broadcasts.

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.

Resonance: In loudspeakers, turntables and arms, mechanical resonances occur when passive parts of the system are excited by certain frequencies in the musical signal. The result is unwanted cancellation or emphasis of some frequencies.

Rumble: Unwanted noise (low frequency) from the turntable drive system, transmitted through the cartridge microphonically and heard on the speakers.

Sensitivity: The amount of signal required to generate a specified output. In the case of speakers, the term 'efficiency' is often used instead.

Separation: Independence of one stereo channel from the other, quoted in minus numbers of dB..

Tracking ability or trackability: Ability of the stylus to follow the record groove modulations even when these are cut at very high levels.

Tracking force or **tracking weight:** Downward pressure on the stylus, usually between 1 and 3 grams. Tracking force is usually adjusted by means of a counter-balance weight on the back end of the arm and is not to be confused with actual mass of the arm itself, or of the cartridge.

Weighting: Bias applied to test measurements to take into account the ear's varying sensitivity to different frequencies, for example 'DIN A weighted, noise figures. These will appear better than unweighted figures. Weighting is also applied to Loudspeaker Efficiency (sensitivity) measurements in this book, hence the two traces 'A' (A weighted) and 'L' (linear, unweighted) on the graphs.

Wow: medium-term pitch variations. Usually measured in combination with flutter to give total speed variations.

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TECHNICAL APPENDIX

This page, for the technically-minded, gives details of test techniques and standards used in the laboratory measurement programme.

Disc tests

1) Frequency response measured using a new JVC TRS1007 test disc and 75uS post-equalisation after the amplifier. Regular checks were made for disc damage. Quoted response is that obtained within ± 1dB limits, at 20°C.
2) Separation was measured at 1kHz with Shure TTR109 test disc which, Shure claim, has accurately aligned modulation axes. This is not assured on other discs. Left and right values were obtained, being the average of values from outside to inside grooves on both sides of the test disc. These were then averaged to give the single quoted separation value.
3) Distortion values were obtained using lateral and vertical signals at 300 Hz, 45um peak amplitude, from CBS STR112 test disc. Both channels were measured and values averaged. A vertical modulation slant error correction factor of −0.488%/degree was used to correct the vertical distortion figure, since the disc is cut at 15°, whilst the DIN VTA Standard is 20°. This reduced the average vertical distortion figure by −2.44%, after which it was averaged with the average lateral distortion value to give a single overall value.
4) Hum and rumble. Disc surface noise and turntable rumble, measured with DIN 45544 disc using IEC A weighting to compensate for the ear's sensitivity to signals of different frequencies.
5) Hiss was measured using CCIR weighting, to account for the ear's sensitivity to high frequency noise. DIN rumble reference level used, arm lifted.
6) Speed variations were assessed with a DIN 45545 disc, accurately centred. Quoted value is for total wow and flutter, DIN weighted, quasi-peak.
7) Speed accuracy at 33.3 rpm measured with DIN 45545 disc.
8) Tracking ability at 1kHz was assessed using B&K 2010 test disc and manufacturers recommended tracking force.

Tuner tests

1) Frequency response quoted within ± 1dB limits.
2) Separation figure is an average value between the two channels, measured at 1kHz. All signals above 18kHz filtered out.
3) Second and third distortion harmonics measured on both channels with wave analyser to give THD at 50% modulation, stereo. Typical tune position used. Single distortion value obtained from average of both channels.
4) Noise level below 100% modulation measured with CCIR weighting and all signals above 18kHz filtered out. Stereo modulation, full quieting.
5) Aerial signal for full quieting, − 1dB.
6) Selectivity – standard IHF alternate channel measurement technique, but manual retuning used for best results, as would occur in use.
7) Sensitivities – standard IHF procedure for − 50dB noise, mono and stereo.

Cassette tests

1) Frequency response quoted within ± 2dB limits using best recommended tape, Dolby in. Replay only response quoted within same limits, using TDK AC337 test tape.
2) Separation is average level at 1kHz, left and right channels.
3) The single distortion figure is an average of values obtained at 40 Hz and 333Hz, OVU record level with best recommended chrome tape. Second and third harmonics measured with a wave analyser and used to compute the values.
4) Noise below OVU at 1kHz measured using CCIR weighting, with best recommended tapes, Dolby in.
5) Speed variations on replay only measured with TDK AC342 test tape. Quoted value is total DIN weighted wow and flutter, quasi-peak.
6) Speed accuracy, replay only, using TDK AC342 test tape.

Amplifier tests

1) Power output is that delivered into 8 ohms, one channel driven.
2) Potential maximum volume computed from loudspeaker sensitivity and amplifier power output. Sound pressure level (SPL) is that at two metres, both channels operating. This is only an approximate value.

Loudspeaker tests

Typical room positioning was used with a single speaker, off the floor, away from the rear wall and asymetrically placed within the room to minimise speaker/room interactions. The measuring microphone was placed 2m from the loudspeaker, on axis. The plots were made using pink noise, analysed by a third-octave real-time analyser with signal averaging.

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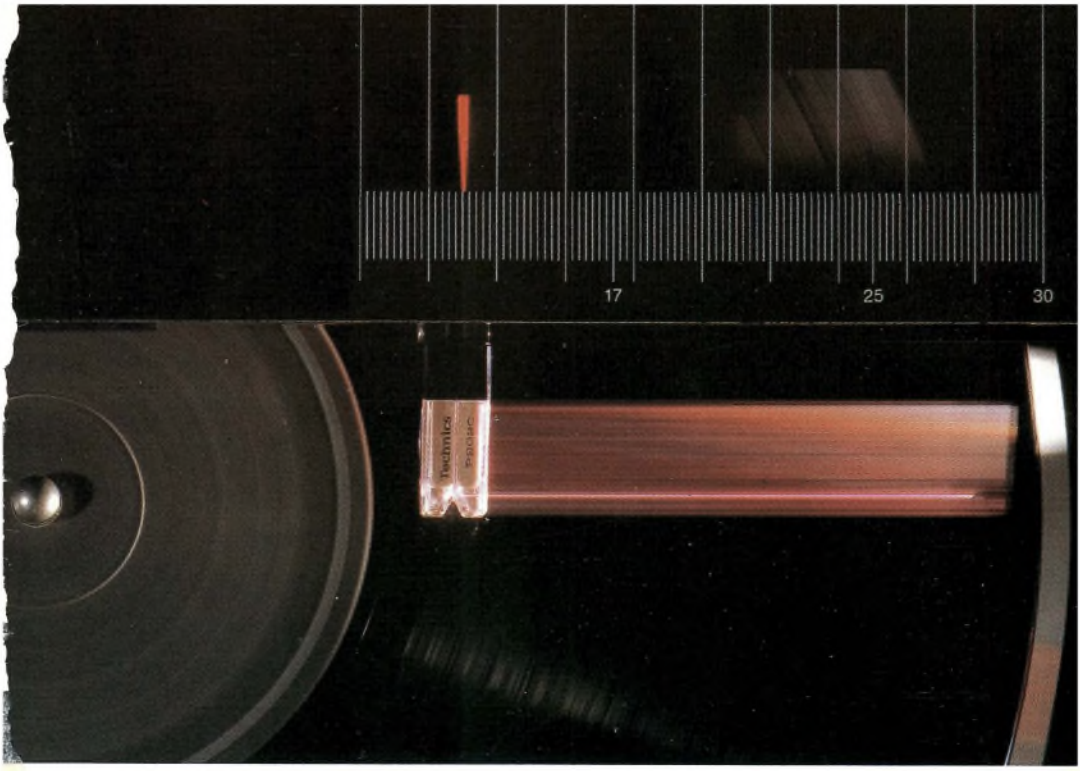

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