

# HIFI STEREO



For the newcomer to high fidelity, the first step is to gain an appreciation of the term itself and others such as mono, stereo, frequency response, noise, distortion, etc. In this chapter, we discuss the history, philosophy and technology of "hifi".

by NEVILLE WILLIAMS

It may come as a surprise to realise that sound recording and reproduction in the home dates back less than 100 years, to around the turn of the century, when the first primitive domestic phonographs (or gramophones) were introduced by Edison, Berliner and others.

At the time, people were captivated by the sheer "magic" of hearing the sound of the human voice, and of everyday musical instruments, being reproduced by a machine. It mattered little that the sound was scratchy and "metallic", as from the inside of a metal drum; the words and the tune could be recognised and that was the wonder of it!

By the mid '20s, the best — and the

most expensive — phonographs were capable of very satisfying reproduction by the standards of the day and it was about then that the British technical writer H. A. Hartley is said to have originated the term "high fidelity" to describe their superior performance, relative to less pretentious, economy models.

Whether or not Hartley invented it, the term "high fidelity" has been used since about then to describe sound reproduction which is plainly above average for any given period.

## Radio or "wireless"

Eventually, emerging radio technology rendered the traditional phonograph (or gramophone) effectively obso-

lete, with electrical recording and reproduction taking over from the mechanical system and offering a further marked improvement in sound quality. By the mid '30s, a modern radiogram and an appropriate record collection had become a status symbol.

## Hifi components

In the fierce competition for market share, it was common practice for component manufacturers to include in their range special "high fidelity" components, which would hopefully contribute to a standard of sound reproduction better than from those of average quality.

Loudspeaker manufacturers, for example, would offer a range of competitively priced models, of various shapes and sizes, intended for use with ordinary mass-produced radio receivers or amplifiers. But, at the top of the range, would be one or more premium quality models — "high fidelity" loudspeakers — boasting better than average all-round performance, and much more expensive both to produce and to purchase.

In fact, the '30s saw the emergence of quite a few manufacturers, notably in Britain, specialising in high fidelity components and amplifiers.

As often as not, with constantly evolving technology, their performance would be rivalled by the next wave of standard components but, by then, a new generation of high fidelity designs would have appeared.

In that sense, successive generations of hifi enthusiasts might be seen as people engaged in an ever-changing, never-ending, but none-the-less rewarding pursuit of the ultimate in sound quality.

## What's in a name?

Initially, the description "high fidelity" was respected throughout the industry and a prospective buyer could reasonably assume that a product so designated would be of premium quality, more expensive but capable of better than average performance.

It would have made life more simple if things had remained that way but, in fact, the designation can no longer be taken for granted.

Indeed, it has even been adopted into the language as a noun, such that some-



# What it means in simple terms Pt 2

body's expressed intention "to buy a new hifi" means simply that they plan to buy new domestic sound equipment, often without any special implications about size, cost or quality.

## Hifi lives on . . .

Confusion about terminology notwithstanding, there is certainly no lessening of present-day interest in what one might call true high fidelity. On the contrary, any amount of equipment is currently available to high quality sound enthusiasts, which significantly outperforms ordinary competitively priced receivers, disc players and tape players.

For lack of a better term, manufacturers and distributors still have to describe it as "high fidelity", relying on its quality and finish, its performance specifications and their own reputation to set the product apart from others which, publicity and superlatives notwithstanding, have been built down to a price.

Equally, enthusiasts and would-be enthusiasts have to learn to question the high fidelity label and exaggerated claims made by non-technical promoters for otherwise ordinary equipment.

For common-sense economic reasons, there is a definite link between quality and price and, while an astute buyer may occasionally pick up a "clearance" or other such bargain from a hifi supplier, it will inevitably still be priced well above standard portable players and "Ghetto blasters".

## That word "stereo"

These days, the term "stereo" is so commonly associated with "high fidelity" that it might seem that the two belong together. While they certainly complement one another in the context of modern sound equipment, they do have quite different meanings.

High fidelity (often abbreviated to "hifi") has to do with the quality or purity of sound. "Stereo" has to do with a sense of dimension or "spread" imparted to reproduced sound by two separate channels of signal information handled by two separate amplifier channels.

Let's explain this in greater detail.

All early forms of sound reproduction used what is best described as a single-channel technique. Irrespective of the number of microphones or other

sources used to create the original program, their electrical outputs were ultimately merged into a single channel to be conveyed to the point of reproduction.

While this was the only practical approach in the early days of sound reproduction, it resulted in a signal which lacked any real sense of dimension and spread. One might indeed capture the sound of a large orchestra but, as reproduced in the home, it all seemed to emanate from a very limited area in the immediate vicinity of the loudspeaker system.

It was often likened to listening to a symphony orchestra through a "hole in the wall" of the concert hall — at worst, a hole about the size of a loudspeaker cone!

Various techniques were tried with amplifiers, loudspeakers and enclosures to lend a sense of spread to the sound with indifferent success. True dimensional information, it was realised, could only be conveyed to the listener by the use of multiple signal channels — at least two, possibly more.

Indeed, there is an immediate parallel

to this in the fact that our own sense of dimension and direction depends on two slightly different information streams reaching the brain through two eyes or two ears.

## Stereo sound

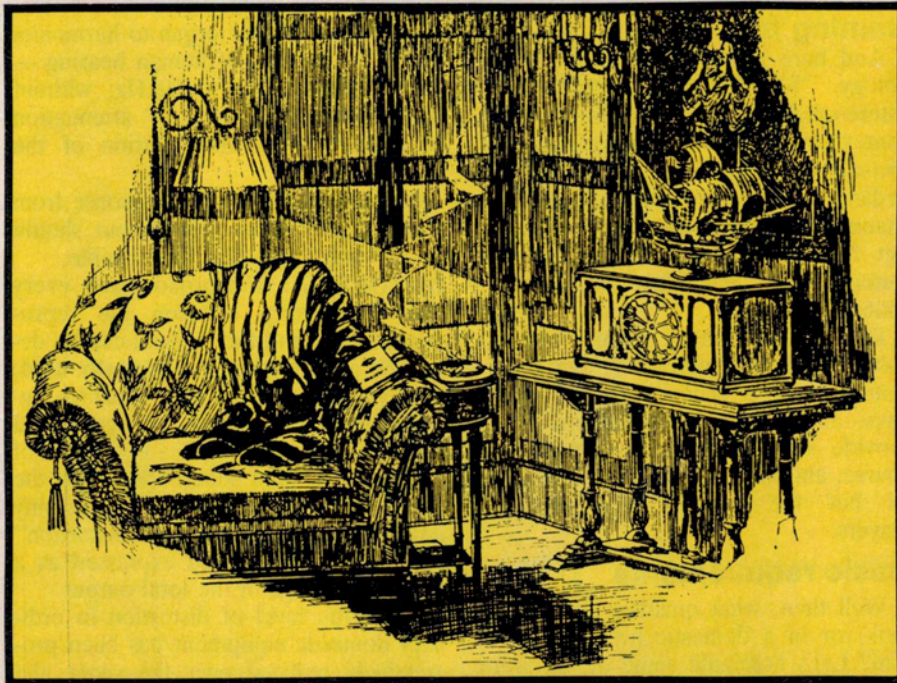
Multi-channel sound was demonstrated in the '30s and subsequently featured in big budget movies such as Disney's "Fantasia".

For in-home sound, the breakthrough into multi-channel reproduction came in the late 50s, when record manufacturers introduced a technique for recording two distinct audio signals within the one record groove — developed in Britain by A. D. Blumlein around 1930.

Some tightening of audio standards was involved but, superficially, the new "stereo" discs looked and played like ordinary single-channel microgroove recordings.

The main difference was that the groove now contained two slightly different versions of the original sound, collected by two separate microphones or groups of microphones.

By recovering the two signals with a suitably designed phono pickup, passing them through separate amplifiers and into separate loudspeaker systems placed two or three metres apart, a vital sense of direction and spread was (and is) imparted to the reproduced sound, adding tremendously to its ultimate realism.



In 1925, about the time the term "hifi" first emerged, this "Ultradyn" radio receiver was being credited by the makers, Phoenix Radio Corporation, with "superb reproductive qualities". Boasting a "quiet manner and eloquent tone", it was advertised in an American magazine for \$135.



# HIFI STEREO — what it means



Beloved of teenagers and others who like to have a radio around, this Akai AM/FM stereo cassette-radio typifies dozens of similar models. Portable, versatile and adequate for casual listening, they nevertheless fall well short of hifi standards.

## Coming to terms

And here a few words about terminology. "Stereo" is a contraction of "stereophonic" which, in the present context, signifies multi-channel (not just two-channel) sound reproduction. To be pedantic, one should really specify two-channel stereo or four-channel stereo but for present-day domestic systems, stereo almost invariably means two-channels.

The complementary term "mono", short for "monophonic", signifies a conventional single channel system. These days, just about all records and tapes provide stereo signals as a matter of course, and are reproduced in stereo by all but the simplest and cheapest players.

## Basic requirements

Well then, what qualities should one look for in a domestic hifi stereo system? Let's nominate some of the more important considerations:

**FREQUENCY RESPONSE:** A true hifi system should be capable of reproducing the full range of sounds from the

deepest notes of the organ to harmonics at the upper limit of human hearing — from around 20Hz to 20kHz; without noticeable accentuation or attenuation of frequencies in any portion of the spectrum.

In short, the frequency response from signal source to audible output should be as "wide" and "flat" as possible.

**DISTORTION:** In a broad sense, every tiny discrepancy between the reproduced signal and the original can be described as distortion. As normally used, however, it has to do with spurious signal components which are generated within the equipment, as a byproduct of its operation, and superimposed on the original signal. As such, it is commonly described as "total harmonic distortion" or simply "THD", and expressed as a small percentage of the total output.

While the level of distortion in ordinary domestic equipment has been progressively reduced over the years, the performance of a hifi system should be markedly better, adding negligible audible distortion to the signal, even as judged by a critical listener.

**POWER OUTPUT:** To qualify as high fidelity, a stereo sound system must be capable of re-creating the highest level of sound likely to be required, again without generating audible distortion; in short, without running into "overload" or "clipping".

To meet this requirement, the amplifiers must be able to deliver a substantially higher level of power than is available from ordinary domestic equipment. How much power depends on the loudspeakers, the size of the listening room, the expectations of the audience, and the nature of the program.

The power output of an amplifier is quoted as so many watts (per channel) before the onset of overload.

**NOISE:** All reproducing equipment introduces some background noise of its own into the ultimate sound — hiss or clicks or rumble from the signal source, hum from the power mains or power supply, hiss from the amplifier circuitry, and so on.

In a high fidelity system, the inherent system noise should be inaudible during very soft passages, to listeners with good hearing, seated in a quiet living room, with the volume set for normal overall program level.

Noise within the system can be assessed more critically by leaving everything set for normal listening and simply switching off the disc or tape drive. Ideally, no sound whatever should be audible from the loudspeakers, even from close up.

In equipment ratings, the noise level is specified in terms of signal/noise ratio, expressed in decibels.

**AMPLIFICATION or GAIN:** The two words have a similar meaning and express a very practical requirement: the amplifier must be capable of boosting the smallest signal likely to be fed to it from a signal source (tuner, disc or tape player, etc) to a level necessary to produce the required power output.

Its ability to do so is commonly expressed as its *sensitivity*, or the number of millivolts of signal which must be fed to the various amplifier input channels (Phono, Tuner, Aux, etc) to produce the rated level of power output.

**WOW & FLUTTER** is a periodic variation in the pitch of a signal, commonly caused by speed variations in playback equipment. Record turntables are most likely to cause a low frequency variation, described as "wow", which is



particularly noticeable on sustained piano chords. Turntables may also exhibit some degree of mechanical "rumble".

Tape equipment is more prone to fairly rapid fluctuations, described as "flutter", noticeable on sustained, high-pitched tones.

While virtually all conventional disc and tape players produce some degree of wow and flutter, neither effect (or rumble either) should be apparent in a modern hifi system.

Almost invariably, true hifi equipment carries manufacturer's ratings and warranties in respect to these and other characteristics, which will be covered in later chapters. Such ratings need to be interpreted in relation to individual requirements. Some listeners have the aural acuity to appreciate the tiny differences between the good and the best; others don't. Some can readily justify the purchase of luxury equipment; others can't.

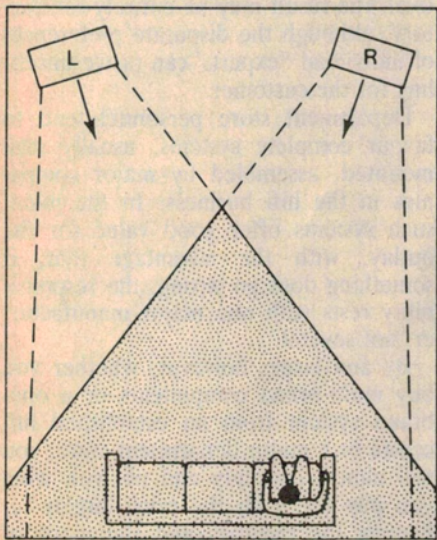
The "bottom line" is that all enthusiasts ultimately must determine their own compromise between what their musical perception warrants, and what their home and their budget can accommodate.

### What's on the market?

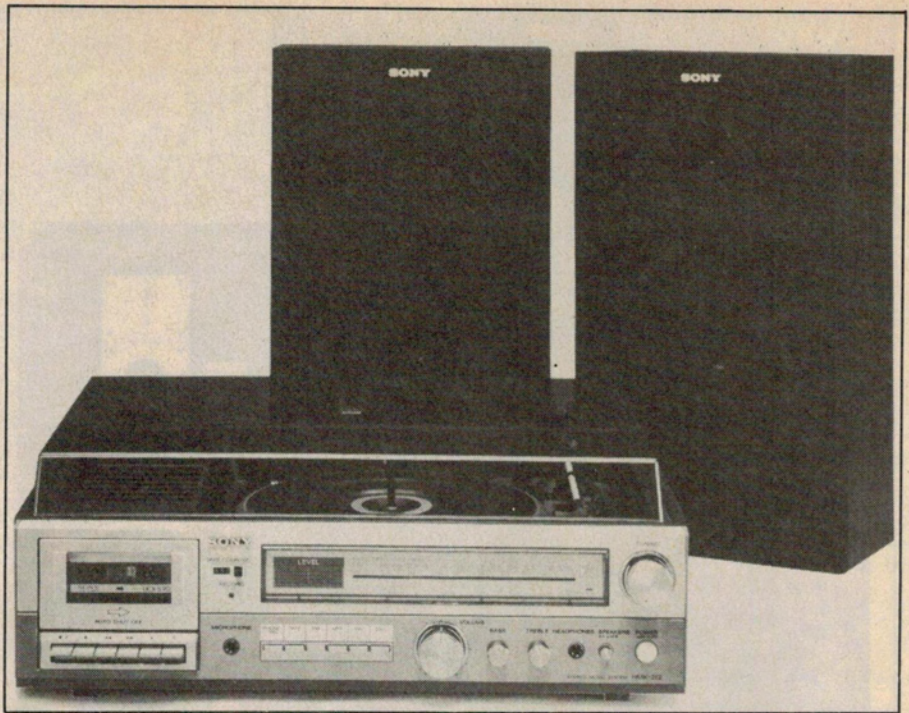
Still keeping the discussion on a general plane, how does typical present-day sound reproducing equipment measure up in terms of fidelity?

At the bottom are "music centres", varying in price from about \$250 to \$500.

Most are intended to be accommodated on shelves and are popular in flats and home units where space is



For effective stereo listening, the furnishings in a room may need to be rearranged. The set-up at left is the simplest and most obvious. Where a greater seating area has to be covered (shown shaded), angling the loudspeakers as at right may give better all-round results.



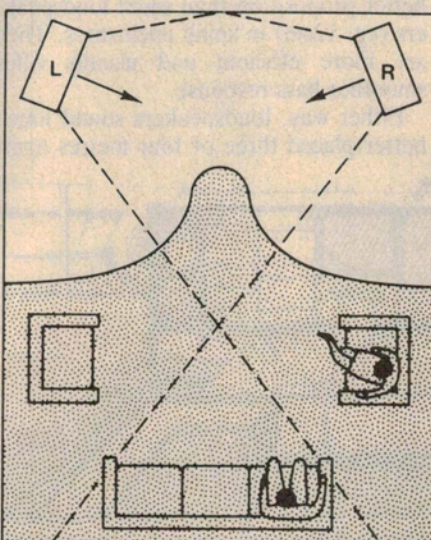
For those on a budget, this music centre from Sony includes a cassette player, turntable, tuner/amplifier and two bookshelf loudspeakers.

strictly limited.

They usually have a tuner/amplifier plus the disc and tape players in a compact central cabinet, with the loudspeakers placed separately on the same shelf, if they are small enough, or otherwise on the floor.

Then there are small but usually more expensive non-integrated systems, with a choice of style-matched units that can be stacked or arranged in various ways to take advantage of the available space.

And there are even budget priced



units intended for rack mounting, along with space for records and tapes, in the manner of more expensive systems.

Together they form a "grey" area, with equipment quality and performance ranging all the way from the "pleasant but ordinary" to low-end hifi.

Equipment of this kind is undoubtedly able to satisfy the needs of the not-too-critical budget-conscious buyers, looking mainly for "pleasant" sound. But it is not for someone who takes their music more seriously and who should really be aiming for something more ambitious from, say, \$1000 upwards.

### True hifi systems

Because hifi fidelity sound is an interest that tends to develop with time, it is wise to start with selected basic but good components, with the idea of adding others as funds become available. The alternative of buying a whole array of cheaper components to start with can all too easily result in a system that will always be mediocre.

At the heart of any hifi system is the amplifier, which should offer a power output of at least 35W RMS per channel, flat over the full audible range and with low distortion. It should have provision for multiple inputs, typically: tuner (AM and FM stereo), phono (magnetic), auxiliary (eg. compact disc) and maybe two tape cassette decks with dubbing facilities.

It will obviously need a volume and





This top-quality rack-mounting system from Pioneer incorporates a 100W per channel stereo amplifier, a 7-band graphic equaliser, a stereo AM/FM tuner, a turntable, a double cassette deck, a timer and two 4-way loudspeaker systems.

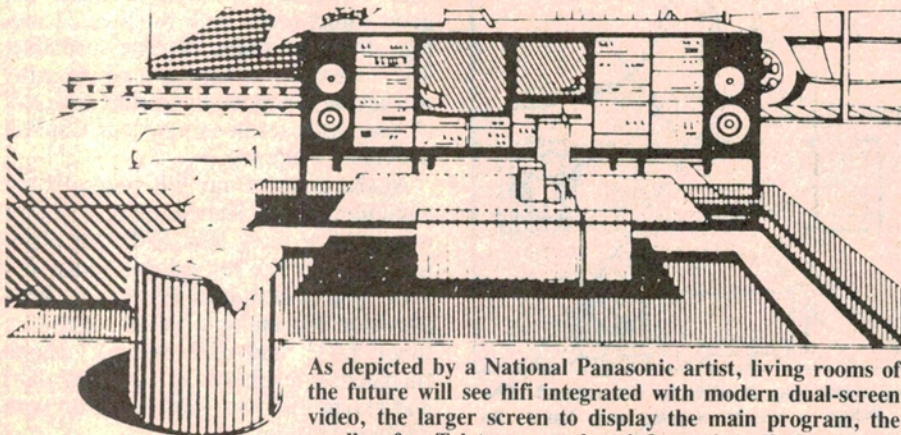
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stereo balance control and provision to select the desired input, plus a socket for stereo headphones. Bass and treble controls and an output level indicator are also useful but be cautious about buying too many panel gimmicks at the expense of basic performance.

Some amplifiers have an in-built AM/FM tuner, being then described as hifi "receivers". These days, with wide-band stereo AM emerging, it may be better to plan for a separate, high performance tuner.

Perhaps more than any other component, the loudspeakers determine the sound of a modern system, so don't skimp in this department. Other things being equal, large (25cm dia.) good quality loudspeakers in large, properly designed enclosures (eg. 75 litres) are a better proposition than small loudspeakers (eg. 12cm) in small enclosures. They are more efficient and usually offer smoother bass response.

Either way, loudspeakers sound much better placed three or four metres apart



As depicted by a National Panasonic artist, living rooms of the future will see hifi integrated with modern dual-screen video, the larger screen to display the main program, the smaller for Teletext or other information display, or to keep track of a second program being recorded.

in a large, carpeted room than closer together in a small, crowded room. So hifi sound does make demands on living space and, if this leads to some difference of opinion, it boils down to whether the hifi equipment is to be listened to or looked at!

As for the signal sources, a high quality turntable, an AM/FM-stereo tuner and a cassette deck were once automatic choices in about that order but newcomers to the art may now logically opt for a compact disc player as the first option. For as little as \$500-odd, it will provide sound quality unequalled by any of the others, although you may certainly want to add them later, as the opportunity and inclination arises.

### Audio/video systems

It should also be mentioned here that, with high quality stereo sound now available on some TV broadcasts and from hifi video recorders, it makes sense to interconnect video and audio equipment, such that video sound can be enjoyed through the hifi audio system. This is something that should be kept in mind when planning for the future.

And planning is certainly necessary. Don't be in too much of a hurry. Read about hifi; talk about hifi; take any opportunity to form a judgment by listening to it in friends' homes; see what's on offer in specialist hifi centres and the better stocked department stores.

In hifi centres, they frequently recommend systems assembled from a variety of different-brand components, perhaps from experience or a sense of hifi "mystique", possibly even with a profit motive! The result may be entirely satisfactory, although the disparate preferences of individual "experts" can prove unsettling for the customer.

Department store personnel tend to favour complete systems, usually rack mounted, assembled by major companies in the hifi business. In the main, such systems offer good value for the outlay, with the advantage that, if something does go wrong, the responsibility rests with one major manufacturer, not several.

By and large, however, whether you buy multi-brand components or a one-brand system from an established hifi centre or a major department store, you will almost certainly end up with what you pay for, with the price largely reflecting the facilities and the merit of your purchase.

Companies which offered twice the value for half the price, or vice versa, have long since fallen by the wayside! ☞