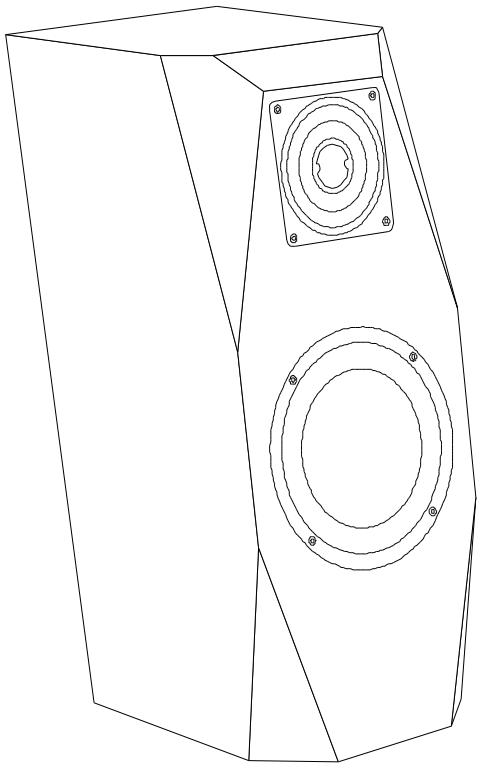
Avalon Professional Products



MIXING MONITOR

Serial Numbers

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This product is certified to meet the requirements of the European Union (EU) Electromagnetic Compatibility (EMC) Directive (89/336/EEC). Because the permanent magnets attached to the loudspeaker drivers produce magnetic fields, it is recommended that the product not be positioned in very close proximity to computer monitors or television sets.

Table of Contents

1 Introduction

The ***Avalon Professional Products*** *Mixing Monitor* was designed by Neil Patel in cooperation with several of the most accomplished recording engineers currently working in the recording industry. Over the years, some of the world's finest recordings have been created using Avalon Acoustics consumer products. Although not designed with the recording professional in mind, Avalon Acoustics high-end products have already brought impressive results into the studio. Special demands, such as robustness, nearfield monitoring focus, extremely high resolution, low noise floor, etc., have prompted us to produce a reference transducer specifically conceived for the astute audio professional.

In spite of the fact that the tonal balance, phase coherence, and impulse response of all traditional Avalon Acoustics products is impeccable, a professional product had to surpass these qualities. Loudspeakers used for the professional recording practice tend to be moved around a lot and play a determining role in the final mix of an audio production. Soundstaging in the monitoring phase of recording must precisely match the actual placement of microphones and instruments. Phase cancellations between microphones must be clearly heard; a half-inch change in mike position must be easily hearable through the monitoring system. They must, above sounding very good, be ultimately revealing towards flaws in the rest of the recording chain. This is evident not only in issues of misplacement of microphones or instruments, but even things such as broken cables or other related disturbances. This means a speaker that is correct in all possible audio disciplines, easy for transportation, and with a robust finish that fits a professional outfit. The recording engineer and record producer are integral elements in creating the mood and dynamic of a recording. We believe that only by providing those artists with the proper tools, will their contribution to a project be fully realized.

What we offer you now is a product that has all of those qualities…

2 Unpacking Instructions

Introduction

Your ***Avalon Professional Products*** loudspeakers were shipped in heavily padded cardboard containers to ensure their safe arrival. It is recommended to save these containers for possible future use.

Contents

The two shipping boxes contain the two loudspeaker units, the owner's manual, and an accessory bag.

The accessory bag contains two pairs of alternate loudspeaker ports, assembly screw and tools, and eight mounting spikes.

Avalon Professional Products loudspeakers are carefully matched in pairs for sonic performance and aesthetics. All matched pairs are sequentially serial numbered, and the lower of the two serial numbers is even. For example, serial numbers MX024 and MX025 are a matched pair. Please check the serial numbers on the loudspeakers to insure that you have received a matched pair.

Note: Matched pairs of loudspeakers are sequentially serialized, with the lower of the two serial numbers as even. Contact your dealer immediately if you have NOT received a matched pair.

2.1 Opening the Container

Carefully cut the packing tape on the top side, and open the flaps to the container (See Figure 2.1).

Next, lift the top cardboard panel off of the loudspeaker. The Mixing Monitor can then be picked up straight out of the box.

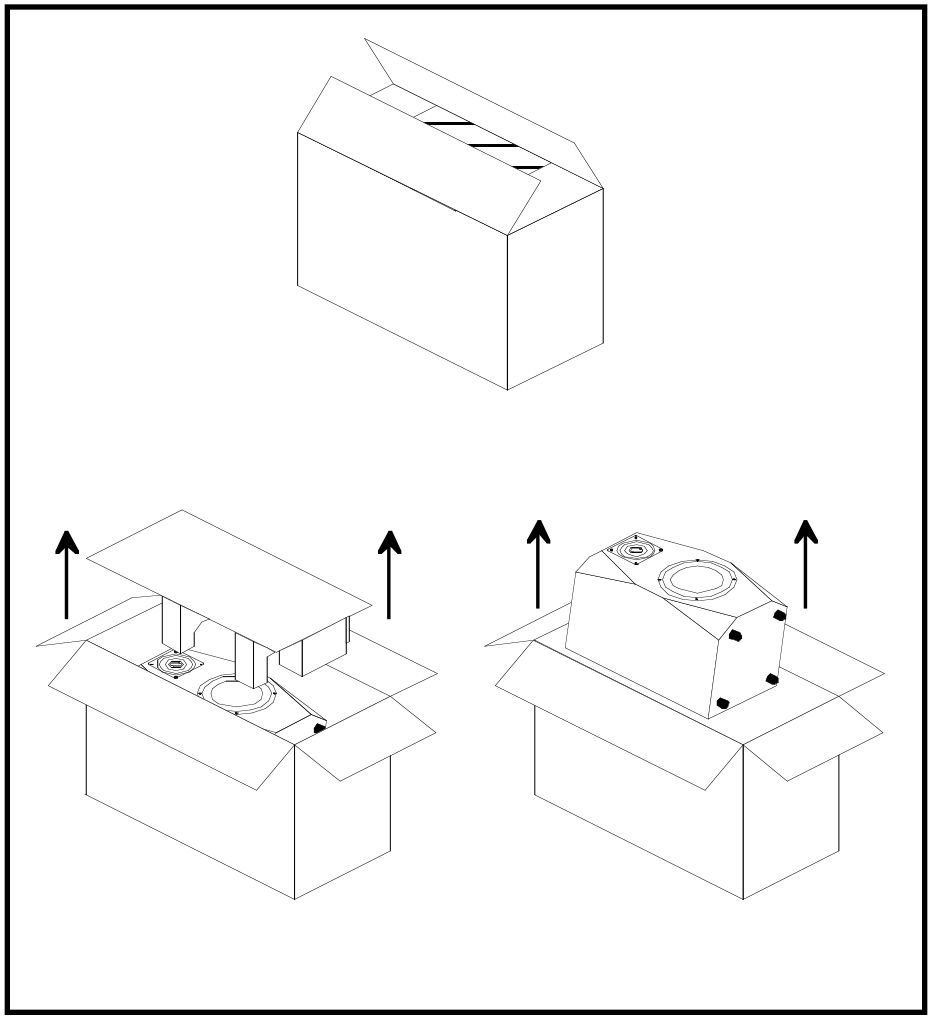

Figure 2.1 – Unpackaging the Mixing Monitors

3 Wiring Instructions

Introduction

The *Mixing Monitor* is equipped with a dual-position advanced material binding Post for connecting the speaker cables. Spade lugs designed for #10 screws are recommended for cable termination.

WARNING: Do NOT over-tighten the screw.

Connecting the Speaker to the Amplifier

1. Carefully unscrew the large fastening knob on the binding post, allowing the fastening plate to expose the posts. (see Figure 3.1).

2. Insert the spades from your speaker cables under the terminal plate.

3. Fasten the spades in place by tightening the large fastening knob.

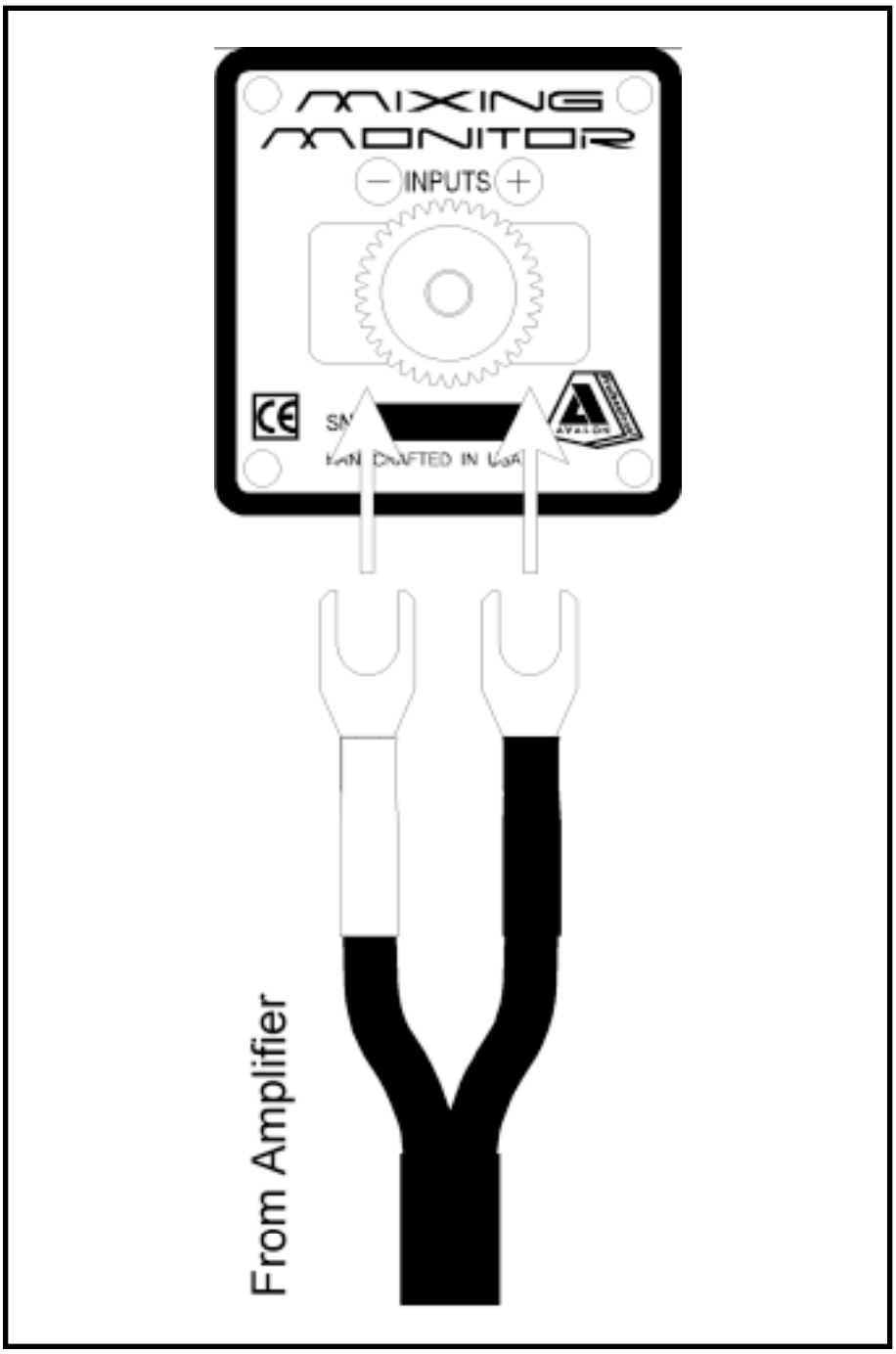

Figure 3.1 – Connecting to the Loudspeaker Binding Posts. Check to insure the correct polarity (positive lead connected to the (+) terminal and negative lead connected to the (-) terminal.

4 Break-in Period

Your new ***Avalon Profession Products*** loudspeakers have an initial break-in period. They will not perform to their full sonic potential when first installed in your system. This is partially due to a residual polarization of the dielectric materials used in the crossover capacitors and internal wiring.[1] As music is played through the loudspeakers, the electrical signal will gradually anneal these materials. Similarly, the suspensions of the drivers will reach their optimal mechanical properties as the speakers are played. Only after the break-in period will the full performance of your ***Avalon Professional Products*** loudspeakers be realized.

The break-in process will occur naturally as music is played through the system. To reduce the time required, it is recommended that the system be played continuously, using either a digital source in the repeat mode or an FM broadcast signal. The recommended break-in procedure is as follows:

- Initial warm-up: three to six hours of quiet music.
- Extended break-in: 100 to 150 hours of moderately loud and dynamic, full bandwidth source material (e.g. Tangerine Dream, Optical Race, RCA 2042-2-P). Many commercially available break in discs containing sweep tracks are also helpful, but should not be substituted entirely for dynamic music material.

During the break-in period, the sonic properties of your loudspeakers may undergo several gradual shifts as the various components break-in at different rates. Midrange attacks may be quite hard with an overall lack of bass impact giving the overall presentation a bright and etched quality. This condition is temporary. It is therefore suggested that the fine-tuning of the system be delayed until after the break-in period is completed. However, during the final phases of the break-in period, the sonic image will open up, the sound-stage will gain specificity, the bass control and impact will increase, and the overall sound will have a more relaxed, involving presentation.

[1] A high-voltage test is applied to wiring and capacitors during their manufacture. This results in a residual polarization of the dielectric materials.

5 Maximizing Performance

These details are imperative to obtaining optimum results from your *Avalon Professional Products* Loudspeakers.

Break-in

The break-in period is critical to maximizing sonic performance and should take place before other adjustments (see the discussion on page 8).

Speaker Placement and Symmetry

Selecting the proper room position for your ***Avalon Professional Products*** loudspeakers can dramatically improve their performance. The following points highlight the fundamental concepts in loudspeaker positioning from the in-depth discussion in Chapter 8, Room Acoustics and Speaker Position (beginning on page 13):

- Left to right room symmetry aids in producing a balanced sound stage.
- Image depth is enhanced when the distance to the rear wall is increased.
- The most even bass response will be attained when the distances to the side and rear walls are not overly similar.

Toe-In

Adjusting the toe-in angle of the speakers is useful in tailoring the sound to best match the characteristics of your system and listening room. When the speakers are facing straight forward, they tend to create a large, expansive sound-stage, painted with broad brush strokes. As they are rotated toward the listening position, the image becomes more compact, with increased focus, creating a greater sense of intimacy.

Start with the loudspeakers facing straight forward, and play either a mono source, or a stereo source with a distinct center image, through both channels. Carefully rotate the loudspeakers inward in small increments to bring the image in precise center focus. Toe-in adjustment is rather delicate, and experimentation is necessary to achieve the proper angle for your listening situation. The optimum angle is usually between three and ten degrees inward, never any more than this. If you find yourself attempting a greater toe-in angle, there must be a flaw elsewhere in the set-up. This is a sophisticated design, with little difference between on and off-axis frequency response. Toe-in greater than 10 degrees will flatten images and reduce true depth information.

Mounting Feet Spikes

Supplied with your ***Avalon Professional Products*** loudspeakers are eight mounting spikes, used to couple the speakers, thereby minimizing time-smearing resonance effects. For maximum articulation and proper tonal balance, the spikes should replace the rubber feet. The result is an increase in focus and solidity of the sonic images.

The rubber feet are removed by simply unscrewing them from the cabinet; the spikes are then installed by inserting them into the same threaded holes from which the rubber feet were removed.

First Reflection Points

Since the ear/brain system tends to integrate the sounds arriving within a 10 millisecond time window, it is important to control the early reflections arriving from the sidewalls to the listening position. A hard-surfaced wall can produce a strong frequency-dependent reflection that can interfere with the reproduced sound-stage, as well as change the perceived tonal balance of the system. Therefore, damping these first reflection points is strongly recommended. Using a narrow bandwidth absorption device (e.g. Sonex) will color the overall tonal balance. Natural fiber materials are always the best choice.

Corner Treatment

It is important to control the first reflections of low frequency sound, which normally occur at the corners behind the loudspeakers. These reflections can cause significant distortions in phase and amplitude, resulting in muddy bass definition and smeared bass transients. Placing DAAD Bass Traps (available from Acustica Applicata http://www.acusticaapplicata.com) in the room corners can significantly control these bass colorations and restore the quickness of bass transients.

Port Selection

The *Mixing Monitor* is supplied with a 2.5" long port installed from the factory, which is tuned to a frequency of approximately 36 Hz. Included with your Mixing Monitors are two additional pairs of ports for fine tuning of your system. The 1.5" long ports are tuned to approximately 42 Hz, and the 3.3" long ports are tuned to approximately 32 Hz.

The installed port is optimally tuned to the internal box volume for best balance of transient response and low frequency extension. Raising the tuning frequency to 42Hz will reduce transient accuracy while increasing the tonal "weight" in the warmth region of the frequency spectrum. An inverse result will be found in lowering the tuning frequency to 32Hz. Transient accuracy will be slightly overdamped, giving the presentation a low Q sonic characteristic. The warmth region will be lean, giving the impression of greater midrange clarity.

All of these scenarios have their acceptable applications in various studio settings. Based on listening taste, room volume, proximity of the *Mixing Monitors* to the primary listener, room treatment, etc.; the choice of port should lend sufficient flexibility in coupling the Mixing Monitors properly within any environment, and with whatever related electronics that might be encountered.

Your *Mixing Monitor* ports are held in place with three clips (See Figure 5.1). To change ports, remove the port clips by removing the port screws using the supplied allen wrench. Once the screws and clips are removed, the installed port may be removed and replaced by the new ports. Remember to fasten the new ports in place by installing the clips and screws, and firmly tighten the fastening screws in place.

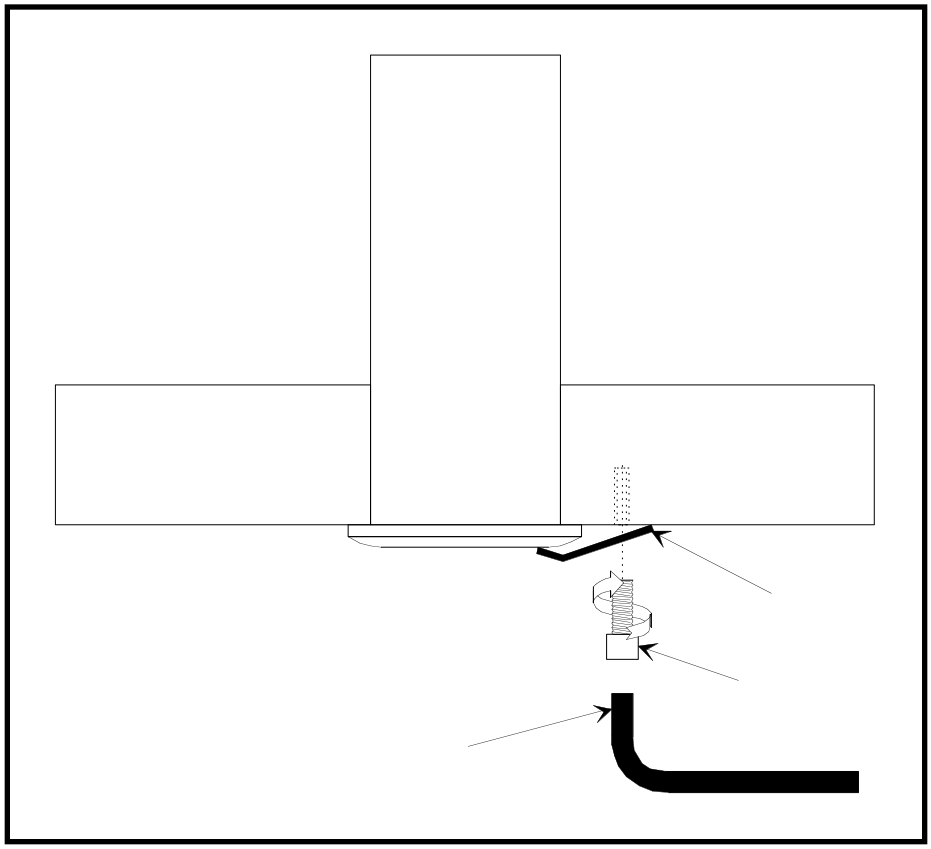

Figure 5.1 – Installing and securing the ports. Fasten the port in three places, using the supplied allen wrench, screws and clips. The screws are installed through the holes in the clips and into the threaded installation holes around the port.

6 Care of Your Avalon Loudspeakers

Cabinet (Black Textured Finish)

The Black Textured finish is an extremely durable high-tech coating. However, due to its textured surface, it requires different care procedures than other finishes. For normal dusting, a lint-free cloth or feather duster should be adequate.

Should the loudspeakers become soiled, moisten a lint-free cloth with lukewarm water, and clean the surface with a circular rubbing motion. If this proves insufficient for an oily or greasy stain, it may be necessary to use a diluted mild soap. This should be applied to a damp, lint-free cloth using a circular rubbing motion to clean the stain.

IMPORTANT: Do NOT use cleaners that contain ammonia, strong solvents, or abrasive materials. Use of these materials can degrade, scratch, or even DESTROY the finish.

Drivers

The drivers (woofer and tweeter) require no regular maintenance. Do not attempt to clean the tweeter dome, as it is easily damaged. Touching the ceramic elements of either driver will leave an oily residue from the skin. Over time these human oils can permeate the ceramic structure and cause failure. **DO NOT TOUCH THE CERAMIC DRIVERS.** If desired, you may remove dust from the woofer cone by using a small, soft dusting brush.

7 Technical Details

Background

Avalon Acoustics loudspeakers have traditionally created a musical sound stage, a harmonic balance of instruments and singers, which is as correct as possible in comparison to the world of real space. Since these designs have proven to be successful in this respect, many professional engineers have asked us for a product that would also have more practical characteristics for the professional; in other words a working tool. What a scalpel is for a surgeon, this speaker is for the professional audio engineer. Knowing how to use the tool is as important as the precision of the tool itself, but ultimately the latter is much easier to master then trying to do the job with the wrong tool. 'Removing an appendix with a chainsaw is possible, but most likely it will kill the patient'…. Recording with a loudspeaker that reproduces it's own character by scattering the sound image with a spread impulse response, and changing the tonal balance by harmonic inter-modulation distortion, is a bit like chainsaw surgery. You end up with a recording that might sound OK on that particular speaker, but the lack of control makes reproduction on other sets unpredictable and mistakes in the recording arrangement might not be detected in time. ***Avalon Professional Products*** has spent a lot of time and effort together with those engineers to produce a product that works like a scalpel and sounds like real music.

Basic Architecture

The basis of this monitor speaker is the same as traditional Avalon loudspeakers with respect to the essential shapes that have proven to produce impeccable phase coherence across the frequency spectrum. Impulse testing (Figure 7.1) demonstrates the correct time alignment of tweeter and woofer. The facets and the backward leaning architecture are fundamental for any Avalon product. What is new is the extra emphasis we put into transient response. It is a proven fact that human hearing has several mechanisms that determine what a sound is and where it comes from. Transient response is likely to be responsible for the localization part of our hearing and thus it should be immaculate in a transducer. Any smearing of impulses causes the ear to start looking for other cues in the sound, like amplitude (volume) and frequency determination. This proves to be a tiring exercise and distracts the mind from the emotional content the musical program has to offer. Stereo reproduction then sounds 2 dimensional and tiresome to listen to, many things we all recognize as being the biggest difference between live music and reproduced music.

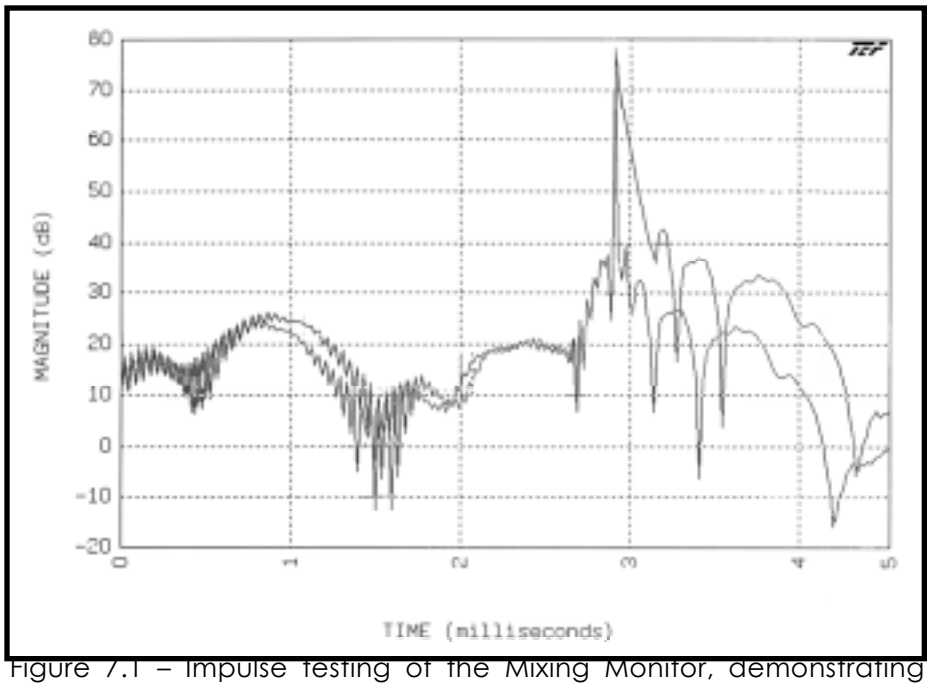

Figure 7.1 – Impulse testing of the Mixing Monitor, demonstrating correct time alignment of drivers.

Special Crossover filtering and signal manipulation, along with carefully chosen materials for the drivers and passive components, gave us the ability to engineer a speaker that can follow the natural impact of sound sources registered by good microphones. Many microphones these days have a transient response (rise and settle time) of less then 15 to 20 microseconds. The new media like SACD and DVD can capture these transients correctly by using very high sample rates and gentle filtering. This means the loudspeaker must be able to follow and reproduce these cues that are so important to our hearing. Figure 7.2 shows the 3-D waterfall plot, detailing frequency response over time. All aspects of the design have been carefully considered for their contributory effect on energy storage and edge diffraction effects. Driver screens are almost entirely acoustically transparent, with the felt diffraction mask on the front baffle being an essential feature for minimal energy storage. The smooth decay plot reveals the Mixing Monitor to be free from resonance and distortion.

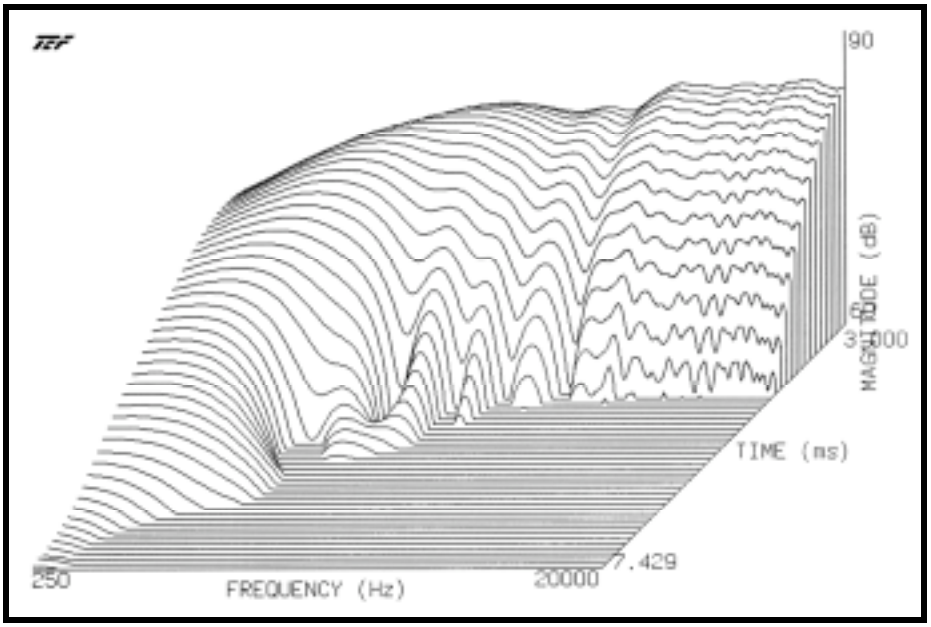

Figure 7.2 – 3-D Waterfall graph of The Mixing Monitor, demonstrating correct time alignment of drivers.

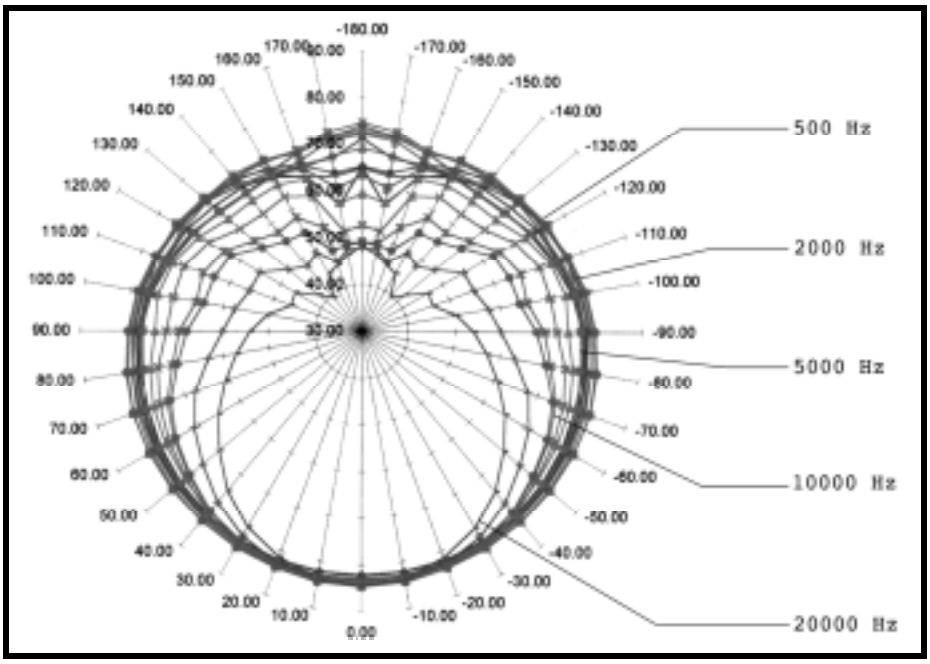

Figure 7.3 – Polar Response of the Mixing Monitor. The combination of State-of-the-Art diaphragm materials, proprietary crossover circuitry, and renowned cabinet construction in The Mixing Monitor produces a smooth and wide polar response that reproduces music unparalleled in accuracy, imaging, and resolution. Note the cardioid pattern that is smooth, wide, and without "lumps". This result translates directly into size relationships remaining constant whether in the center of the mix, or placed off to the sides. An open stage presentation without size or tonal distortion is the result.

How to use the Mixing Monitor

This monitor is designed as a quasi mid-field speaker. This means the distance for optimal frequency and impulse response is between 1.2x and 1.4x (with x being the distance from tweeter to tweeter). Theoretically the loudspeakers can be as close or as far apart as required, the limitation being first reflection artifacts from wall or other surfaces, and the ability of the amplifier to deliver coherent and resolute energy. This latter effect limits the distance the speakers can be spread apart, but is not a function of the speaker itself. Soundstage and tonal balance are reproduced optimally with this formula, given the restriction of a relatively neutral control room. If the latter is less ideal you may change the bass response of the units by replacing the port on the bottom-side (see Port Selection on p.10). This then will introduce a trade-off situation between impulse response and frequency response. Beyond about 2.5x, the loudspeakers will once again throw a wide and coherent soundstage. This affords musicians standing at the rear of the control room who are listening to playback the ability to get a good feel for what they have recorded.

What you will find however is that the performance of this speaker is less likely to be dependent on the room it is used in, primarily because the coherence of initial transient response is very high, and will build up the sound stage very easily. Where you would have to spend a long time tuning traditional speakers during set-up, this process will be a lot easier with these units; again an advantage for the professional recording engineer. What you will find is that the clearness and accuracy of the reproduced sounds offers you a wide range of choices as to how to manipulate these sounds, and ultimately, improve your work.

Again the cuts you are able to make with this scalpel are very delicate…

8 Room Position

Introduction

The listening room forms the final link of the playback system, as important as any other component in the chain. Just as an otherwise superb system is handicapped by an inferior pre-amplifier (for example), so can a well-matched system be hindered by poor room acoustics. It is not necessary to listen to your system in a specially-designed sound chamber in order to enjoy it. In fact, a dedicated listening room usually requires additional sound treatment, due to a lack of other items in the room that can help provide proper acoustics. However, attention to the listening environment can greatly increase your system's performance.

Listening in a properly set-up room can be a startling experience. Due to the limitations of the two-channel format and the listening environment, the illusion of actually being transported to the recording site cannot usually be achieved. However, an uncanny sense of realism can be created. Perhaps it is best described as if the front half of your listening room has been removed, so that it now opens out into the recording site.

To optimize your equipment set-up and the listening-room acoustics requires a basic understanding of the principles which affect the propagation of sound in the room. Also, we will discuss the way in which our brain interprets spatial cues, and how the room acoustics can affect our sonic perceptions.

An Optical Analogy

Let us use an optical analogy to aid our understanding of acoustics. Imagine that you are in a room that is lit only by a candle in its center. There is a uniform amount of light cast in all directions. If a large mirror is held closely to a candle, one half of the room becomes darkened, while the other half receives twice as much light. This is because there are effectively two candles now illuminating that half of the room, the real candle, and the virtual (or reflected) candle. The energy that had been sent to both sides of the room has now been concentrated in one side only.

If we repeat the same experiment using a large piece of black cloth instead of a mirror, the results will be somewhat different. The side of the room behind the cloth is darkened, just as before, but the level of light on the side of the candle remains unchanged. This is because the light is absorbed by the cloth, rather than being reflected back into the room.

Thus we can see that the energy can either be absorbed or reflected. A similar situation occurs with sound waves, although we must account for the much greater wavelengths of audible frequencies. Of course no material is a perfect absorber or an absolute reflector. Furthermore, the sonic absorption coefficient of a given material usually varies with frequency.

Basic Room Acoustics

The great majority of all listening rooms are rectangular, with parallel surfaces. The walls and ceiling are typically hard surfaces, which are acoustically reflective. These large areas are the predominating factors in the overall room acoustics, although the other items in the room (furnishings, carpeting, wall hangings, doorways, etc.) will also play a role. Without going into excessive detail, there are four primary areas of potential concern:

- 1. Standing waves.
- 2. Flutter echo.
- 3. Early reflections.
- 4. Bass reinforcement.

The first three items are problems which should be reduced or eliminated. The last item, bass reinforcement, needs to be matched to the entire system for proper tonal balance.

8.1 Standing Waves

The parallel surfaces of most listening rooms can lead to a potential problem in the low frequencies. A sound wave can be repeatedly reflected from opposing surfaces, back and forth. If the distance between the surfaces is an integral multiple of one-half the sound wavelength, a standing wave will be set up. This means that the incident and reflected waves combine with each other so that a stationary pattern of high and low sound pressures is established in the room. This irregular distribution of sound level is caused by cancellation and reinforcement between the reflected and direct sound waves.

At high frequencies, this pattern of high and low sound pressure levels within the room becomes too finely spaced to be discerned. However, when the dimensions of the room are comparable to the wavelengths of the musical notes, there will be obvious changes in the intensity of certain bass notes in different locations within the room. Additionally, the existence of the standing wave implies a resonant condition where acoustic energy is stored in the room. This energy storage can result in "heavy", "muddy", or "slow" bass.

Since the presence of standing waves is caused by parallel reflective surfaces, practically every listening room suffers from this problem to some degree. However, several factors are working in our favor here. First, as the room size increases, the affected frequencies become lower and thereby less audibly apparent. Second, the presence of shelving or furniture against the walls will break up the large surfaces, reducing the magnitude of the problem. Third, upholstered furniture can absorb a significant amount of bass, diminishing the build-up of resonant energy. Fourth, typical wall construction is not completely reflective at low frequencies.

However, in some cases audibly objectionable standing waves will still be present in the listening room. This can be noted by large variations of the intensity of certain bass notes in different areas of the room. Another indicator is an unevenness of loudness of different bass notes. (This is sometimes what is actually on the recording, so be sure that this is consistently a problem on a variety of recordings.)

If you wish to reduce or eliminate standing waves that may exist in your room, it will be necessary to reduce the low-frequency reflectiveness of at least one of the parallel opposing surfaces. The most effective method is to use DAAD's, available from Acustica Applicata. This is the only commercially available sound treatment that absorbs significant amounts of energy below 400 Hz. Experimentation will be needed to determine the optimal locations.

8.2 Flutter Echo

These same parallel, reflective surfaces can also produce a different audible problem. If there is little absorption at higher frequencies, a musical transient containing high frequencies, such as a hand clap or the strike of a percussion instrument, can be heard bouncing repeatedly between the surfaces. Called flutter echo (or slap echo), these multiple reflections can obscure musical detail. The situation is analogous to standing between two parallel mirrors, when the outline of your reflection becomes more difficult to discern, due to the additional reflected images present.

Again, it is only necessary to reduce the reflectiveness of one of the surfaces in each pair of surfaces to eliminate flutter echo. Since we are concerned with the high frequencies, any soft material is appropriate. Drapery or fabric wall hangings are quite effective on the walls. Bookshelves also work well by breaking up the flat surfaces. Carpeting should eliminate potential problems between the floor and ceiling.

8.3 Early Reflections

Another situation that can reduce the subjective quality of reproduced sound is the presence of early reflections. By early reflections, we are referring to reflected sound waves that reach the listener within 10 to 20 milliseconds of the direct signal from the loudspeaker.

When a reflected sound reaches the listener more than 40 milliseconds later than the direct sound, the reflection is heard as a discrete echo. However, if the reflected sound arrives within around 20 milliseconds of the direct sound, the ear/brain system integrates the two sounds so that only one sound is heard. This integration is done in such a way that spatial information is preserved, providing an acoustical "picture" of the physical space that created the reflections.

However, the source recording also contains ambient information that portrays the original recording site. Early reflections in the listening room will tend to obscure the ambient information in the recording, leading to a loss of dimensionality or spaciousness. Secondary arrivals within the first 10 milliseconds are especially problematic, becoming less troublesome as the arrival time lengthens to 20 milliseconds or so.

Avoiding Early Reflections

The speed of sound is approximately one foot (30 cm) per millisecond. Therefore, to preserve the natural soundstage on your recordings, there should be no reflected sounds arriving at the listening position with a path length less than ten feet (3 meters) longer than the direct path from speaker to listener (see Figure 8.1). This means that if the speaker or listener is placed closer than about five feet to a wall or other surface, that surface should be covered with sonically absorbent material.

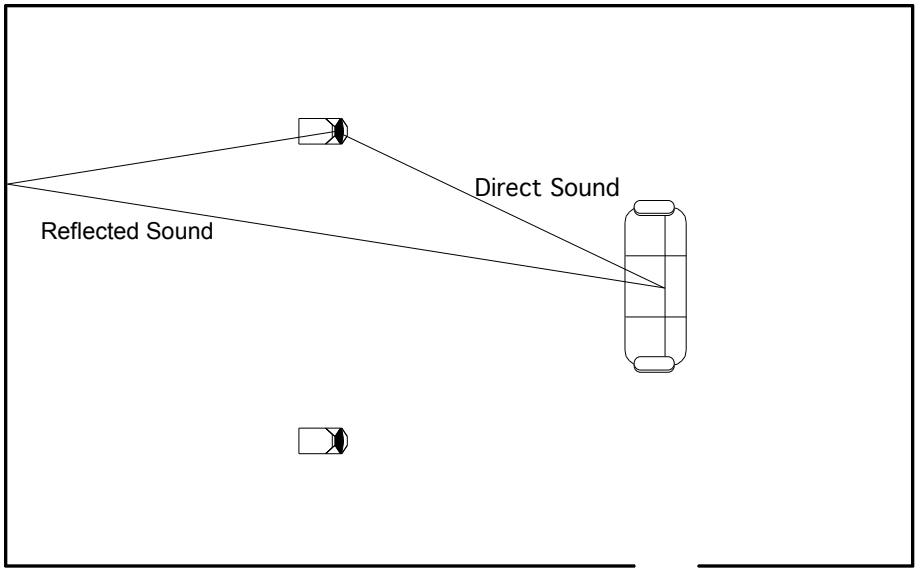

Figure 8.1 - The reflected sound must travel further than the direct sound, and therefore reaches the listener at a later time.

Since the floor is within five feet of the speaker, it is best to have a carpeted floor to absorb floor reflections. A thick, dense carpet and pad will absorb lower frequencies more effectively than a thin one. Due to their complex structure, carpets and pads of natural materials, such as wool and jute, will exhibit a more uniform absorption over the frequency spectrum than synthetic materials will.

It is not necessary to acoustically treat the entire room to achieve good results. Strategic treatment of specific locations can realize considerable benefits. Remember that when sound waves reflect from a flat surface, the angle of reflection is equal to the angle of incidence, just as a mirror reflects light waves. Therefore, the most important location for sound absorbing material is the point where the sound waves reflect to the listener (see Figure 8.2).

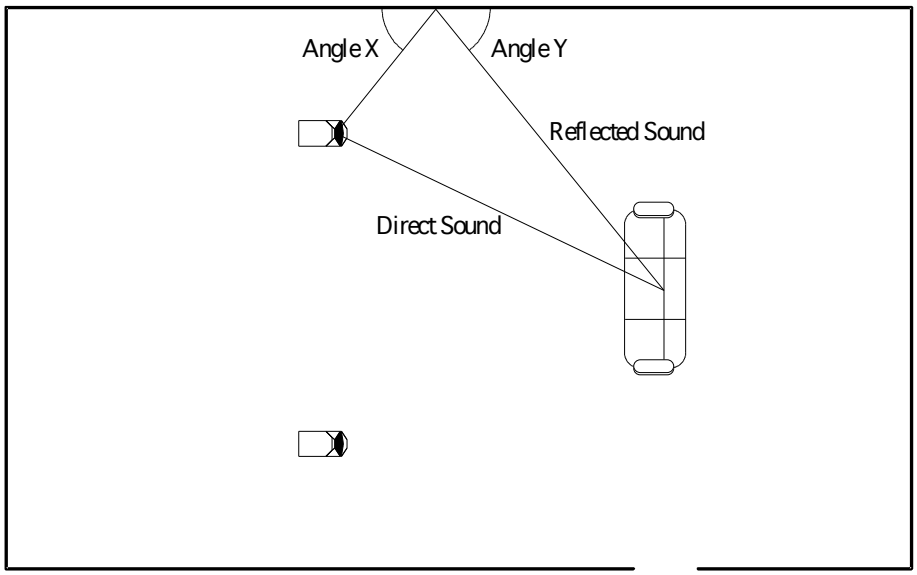

Figure 8.2 The sound is reflected at the same angle that it struck the surface; i.e., Angle X = Angle Y. Since light waves obey this same rule, a mirror can be used to find the point which can be acoustically damped to avoid early reflections.

8.4 Bass reinforcement

By bass reinforcement, we mean the effect of the room boundaries on the propagation of sound. It is widely known that speaker placement relative to the floor and walls can affect the relative amount of bass that the system produces.

To make this interaction more clear, let us refer to the optical analogy of the candle. Similar to the way that the mirror reflected the light of the candle, so can the surfaces near the loudspeaker reflect the sound waves back into the listening room. However, when the path length difference of the reflected wave is short relative to the wavelength of the sound, the reflected wave is substantially in-phase with the original wave. When this condition is met, **the coupling coefficient between the speaker diaphragm and the air increases, and the speaker efficiency increases. This changes the actual frequency response of the speaker, and is not attributable to standing waves or other room resonances.**

As frequency increases and wavelength becomes more similar to the distance to the boundary, the phase difference between original and reflected waves increases, and the air coupling effect is diminished. In particular, when the wavelength equals about four times the distance to the boundary, the reflected wave is antiphase to the original wave, resulting in a cancellation (dip) in the output. At frequencies above this level, the effect becomes less significant and creates similar but smaller variations in output. Figures 8.3 and 8.4 illustrate these concepts.

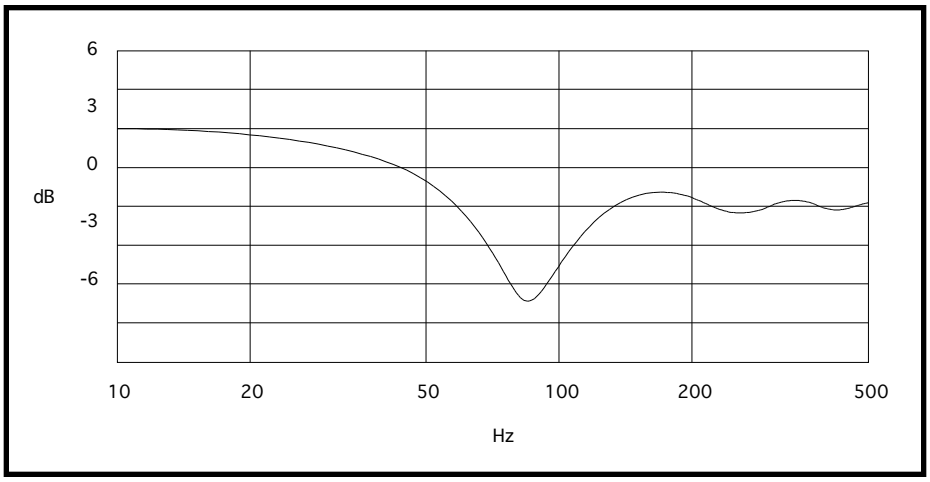

Figure 8.3 - Change in frequency response resulting from placement of speaker 3.3 feet from a reflective surface (relative to an anechoic environment).

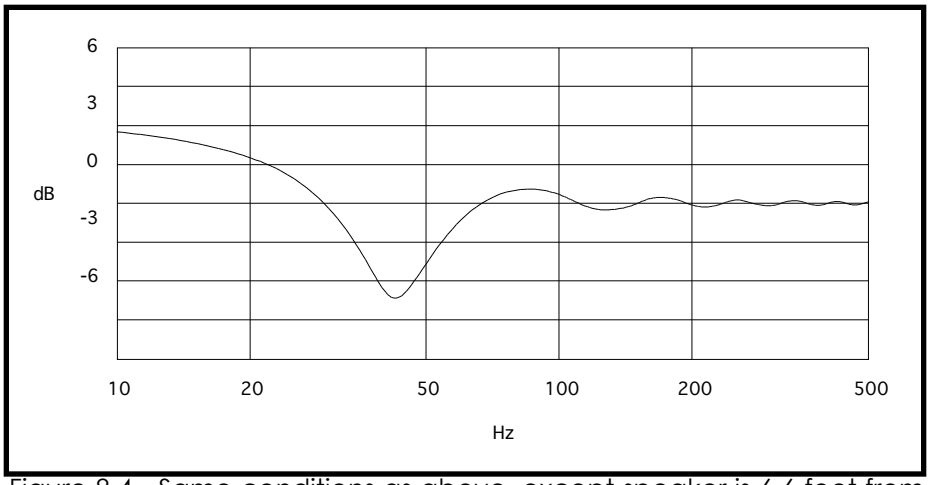

Figure 8.4 - Same conditions as above, except speaker is 6.6 feet from the reflecting surface. Note how the cancellation and reinforcement occur at lower frequencies.

There are typically three reflective surfaces near each speaker: the floor, the rear wall, and the side wall. Each of these surfaces produces its own reflection, and hence its own cancellation and reinforcement. By properly selecting the distances to each surface, we can provide a uniform and extended bass response. Conversely, improper placement of the loudspeakers can result in uneven frequency response, resulting in diminished bass quality.

In order to take full advantage of bass reinforcement and to provide the most uniform and extended bass response, it is recommended that the loudspeaker be placed between three and seven feet from one of the walls (side or rear), and between five and fifteen feet from the other wall. The measurements are made from the wall to the center of the 9" woofer cone. The exact distances are not overly critical, although the two distances should not be within about 33% of each other.

A good rule of thumb in establishing the lateral position of any quality transducer is to apply the ratio 4 : 10 : 4. In other words, the distance to the side wall is 4/18 (or about 22.2%) of the room width, and the distance from speaker to speaker is 10/18 (or about 55.5%) of room width.

8.5 Summary of Recommendations

Now that we have looked at some of the common problems of listening rooms, as well as their remedies, let us summarize our findings and recommendations.

Flutter Echo and Standing Waves

These situations are the result of the room having parallel, reflective surfaces. The potential problems are independent of the audio system, and need to be addressed at the source. This means that at least one surface in an opposing pair of surfaces needs to be made less reflective and/or non-parallel.

- High Frequency Absorption and Room Symmetry

Since flutter echo is a high-frequency effect, it becomes much easier to manage potential problems in this area. Almost any item attached to the walls will be less reflective at high frequencies than the bare walls themselves. Draperies, wall hangings, paintings, bookshelves and other items will normally be present in the room, and will usually eliminate any possible problems. If flutter echo is still audible, a fabric wall hanging provides an effective and attractive cure.

Additionally, it is desirable to maintain a degree of left/right symmetry in the room to preserve a balanced acoustic "space". For example, if your listening room has full length draperies along the right wall, and the left wall is bare, slap echo will not be a problem. Nonetheless, the sound-stage may be somewhat distorted, and it could be beneficial to place a fabric hanging or tapestry on the wall opposite the draperies.

- Parallel Surfaces

Although it is not generally possible to make the walls non-parallel, the same effect is achieved by breaking up the large, flat surfaces with furniture and shelving.

Speaker Placement

Although your ***Avalon Professional Products*** loudspeakers may be placed in a wide variety of positions relative to the walls of the room, it is still wise to experiment a bit to achieve optimal results. The suggested minimum distances for the Mixing Monitor are two feet from one wall (side or rear), and four feet from the other (all distances are measured to the center of the woofer cone). This will provide the proper degree of bass reinforcement, as well as minimize early reflections.

The suggested maximum distances for the Mixing Monitor are five feet from one wall (side or rear), and ten feet from the other. As the distance from the speaker to the nearby walls increases, early reflections become less of a problem, and the sound-stage becomes more spacious. However, regardless of the absolute numbers used, the most even bass response will be attained if the distances from the side wall and the rear wall are not overly similar.

Early Reflections

When arranging the furnishings in your listening room, remember that reflective objects should not be within a five foot radius of either the speaker or listener to avoid early reflections. This suggests the possibility of a dual-purpose room, with one end devoted to music reproduction, and the other end for another use, such as a study or office. In this way, the area behind the listener will contain items that will reduce problems with standing waves and/or flutter echo, while the zone around the speakers remains relatively free from reflective objects.

If you wish to achieve an even more spacious sound-stage, it may be useful to place a sonically absorbent material on the side and rear walls near the speakers. This can be particularly effective at the points where the sound wave is directly reflected to the listening position (a mirror can be used to determine these points, as illustrated in Fig. 8.2). As the distance to the wall becomes smaller, the suppression of these reflections becomes more important.

Early reflections will tend to diminish the soundstage in the direction of the reflections, i.e. early reflections from the side walls tend to reduce sound-stage width, while early reflections from the back wall will reduce image depth. We have found that a strong sense of depth enhances the feeling of involvement when listening, due to the three-dimensional solidity of images. Therefore, it is more important to have a greater distance from the speakers to the rear wall than to the sides walls. Typically, this is easier to achieve if the speakers are placed along the short wall of the listening room.

8.6 A Control Room Example

In order to make these points more clear, an example of a control room layout is given in Figure 8.5 and Figure 8.6, illustrating the principles we have given.

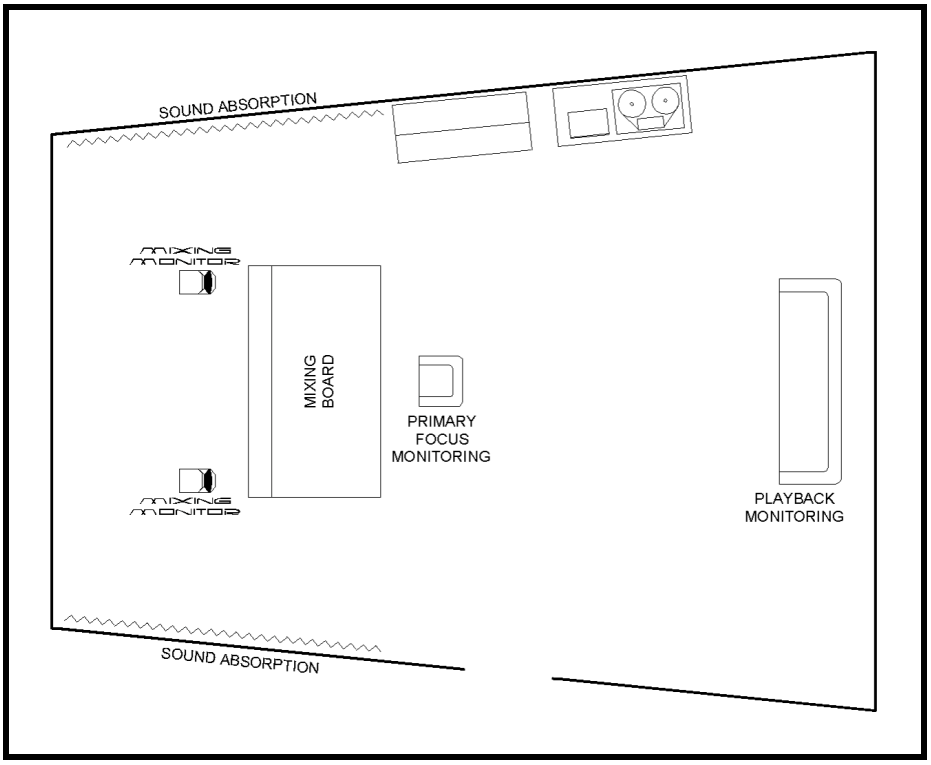

Figure 8.5 - Control Room Overhead View. The area around the speakers is free of objects that would produce early reflections. Sound dampening materials absorb the reflection from the side-wall and help maintain left-right symmetry. Primary focus monitoring is about 1.2 times the distance from speaker to speaker, and playback monitoring is near the rear wall.

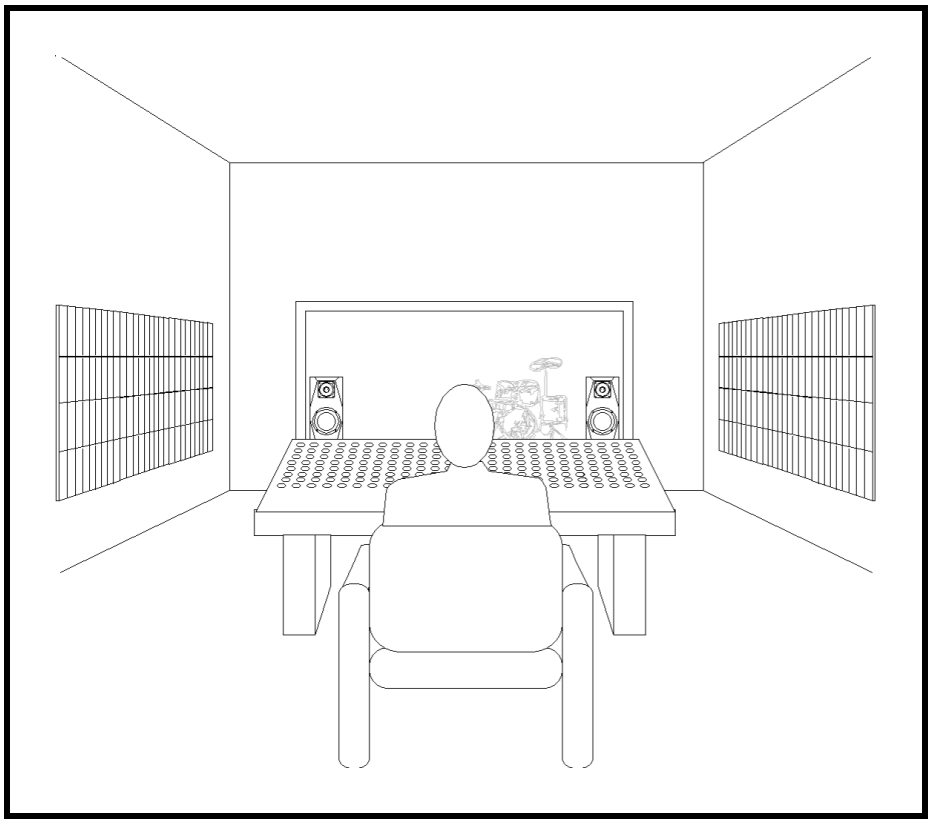

Figure 8.6 - Control room Front View. The speakers are elevated slightly from the listener's ears, and they may be toed in slightly.

9 Warranty

Your ***Avalon Professional Products*** loudspeakers are warranted against defects in workmanship and materials for a period of one year, whereas the driver units are warranted for 90 days. This warranty is transferable to subsequent purchasers within the original one year period. A complete statement of warranty is given below.

This warranty does NOT apply to loudspeakers which have been abused or exposed to excessive or abnormal signal input.

In the Event of a Problem

In the unlikely event of a problem with your ***Avalon Professional Products*** loudspeakers, the component most susceptible to failure is one of the driver units. If driver replacement is required, have your dealer contact ***Avalon Professional Products***. The individual performance curves of the drivers in each pair of loudspeakers are kept on file at the factory. This enables ***Avalon Professional Products*** to supply an exact replacement unit, ensuring continued operation at the highest level of performance. The defective driver must then be returned to the factory for inspection to determine the status of the warranty claim. This on-site replacement of the driver units eliminates the time and expense of shipping the entire speaker to the factory for repair. **All warranty claims must be made through an authorized *Avalon Professional Products* dealer or distributor.**

Warranty Statement

1. ***Avalon Professional Products*** warrants the materials, workmanship, and proper functioning of this product for a period of one year, whereas the drivers are warranted for 90 days. If any defects are found in the materials or workmanship of this ***Avalon Professional Products*** product, or if the product ceases to properly function within the appropriate warranty period from the date of first purchase, the unit will be repaired or replaced by ***Avalon Professional Products*** or its authorized agent after receiving authorization from the factory or dealer.

2. Purchaser must return the product, packaged in the original shipping carton, freight prepaid to:

Avalon Professional Products
1140 McDermott Drive
Valley Plaza / Suite 107
West Chester, PA 19380

3. ***Avalon Professional Products*** reserves the right to inspect any products which are the subject of any warranty claim prior to repairing or replacing. Final determination of warranty coverage lies solely with Avalon Professional Products. Any products which do not conform to this warranty shall be repaired or replaced by Avalon Professional Products as soon as possible following receipt of the product and claim, but in no event later than 30 days after receipt of the product. Out-of-warranty claims will be billed for labor, materials, return freight, and insurance as required. Any product for which a warranty claim is accepted will be returned to the purchaser and cost of shipping and insurance will be factory prepaid within the boundaries of the USA. Units to be shipped outside of the USA will be shipped freight collect only. This warranty gives specific legal rights. The purchaser also has implied warranty rights, and may also have other rights which vary from state to state.

4. This warranty is extended to the purchaser and any purchaser from him for value.

5. Avalon Professional Products strives to manufacture the very finest possible equipment, and therefore reserves the right to make changes in design and improvements upon its products, without necessarily assuming an obligation to retrofit such changes upon its previously manufactured models.

6. The above warranty is the sole warranty given by Avalon Professional Products, and is in lieu of all other warranties. All implied warranties, including warranties of merchantability or fitness for any particular purpose shall be strictly limited in duration to one year from the date of original purchase, and upon the expiration of the warranty period (one year), Avalon Professional Products shall have no further obligation of any kind whether express or implied, including but not limited to merchantability. Further, Avalon Professional Products shall in no event be obligated for any incidental or consequential damages as a result of any defect or any warranty claim, whether express or implied. Some states do not allow exclusion or limitation of incidental or consequential damages or limitations on how long implied warranties last, so the above limitations and exclusions may not apply to you.

7. Avalon Professional Products does not authorize any third party, including any dealer or sales representative to assume any liability for Avalon Professional Products, or make any warranty for Avalon Professional Products. The unit must not have been altered or improperly serviced or repaired. The serial number on the unit must not have been altered or removed.

10 Features

- Advanced light weight driver diaphragm materials minimize energy storage and time-domain distortion.
- Each driver individually tested and matched for optimum performance.
- Smooth, wide polar response for superlative imaging capabilities.
- Moderate impedance characteristic allows for ideal interface with any amplifier.
- Star-grounding techniques eliminate signal modulation.
- Crossover circuitry is hard-wired with surface-only conductors, eliminating deleterious sonic effects of printed-circuit boards.
- Oversize binding post.
- Careful crossover control of all magnetic field interaction.
- Polypropylene capacitors used exclusively to minimize energy storage.
- Proprietary damping circuits control each driver's electrical parameters, reducing interaction with the amplifier.
- Constrained-mode damping system absorbs cabinet vibrations.
- Three inch thick front panel supplies acoustically inert wave-launch platform.
- Acoustically-engineered grille assembly decreases edge diffraction effects.
- Distinctive faceted cabinet design provides optimal polar characteristics.

11 Specifications

Driver Complement	1" concave ceramic dome tweeter 7" concave ceramic woofer
Sensitivity	87 dB (2.83V, 1 meter)
Impedance	6 ohms (5.5 ohms minimum)
Frequency Response	58Hz to 24kHz (+/- 1.5 dB, anechoic) (In room, typical -3 dB point is below 46Hz)
Recommended Amplifier Power	15 to 150 watts
Wiring Methods	Two Position binding post
Dimensions	21.5" high 8 .5" wide 11.75" deep
Weight	41 pounds (each)

12 Notes