Acoustical Analysis Report

for

Joe Average

Quest Acoustical Interiors Inc

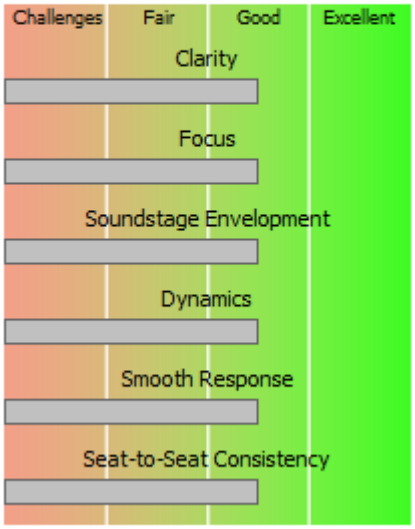
System Performance Summary

Audio Calibration Report

An HAA Calibration assures that your system will be reviewed, verified, and tuned by a trained HAA Calibrator. Each element of system performance is reviewed and aligned for best integration and best performance. This summary report is designed to provide a snapshot overview of all the elements the calibrator has reviewed. An additional Master Report is available with more in depth explanations of the process and the results. Take some time to review the report and discuss the results with the calibrator.

Sonic Evaluation

Here we review the metrics of quality sound. These goals not only provide our listening standards, they help point the way to a better design strategy.



Listening Position Response

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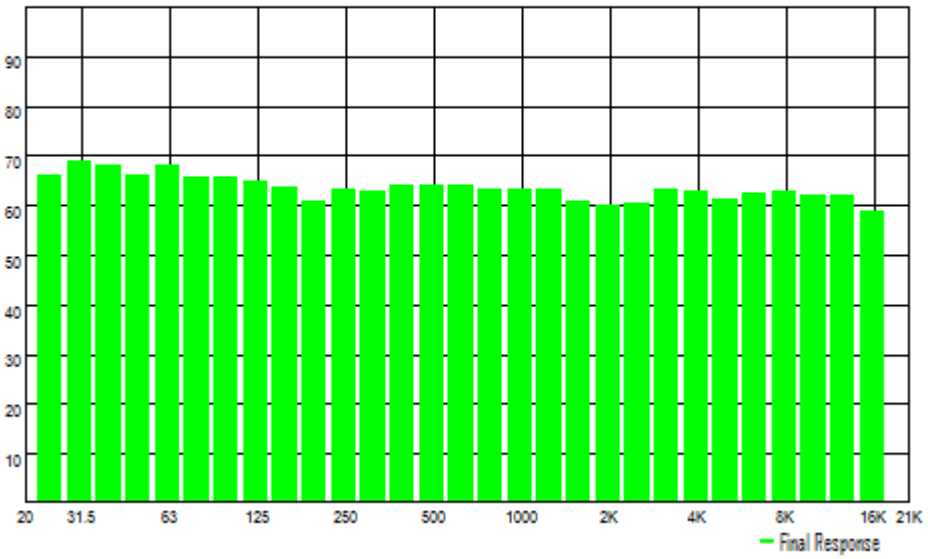

Functional Verification

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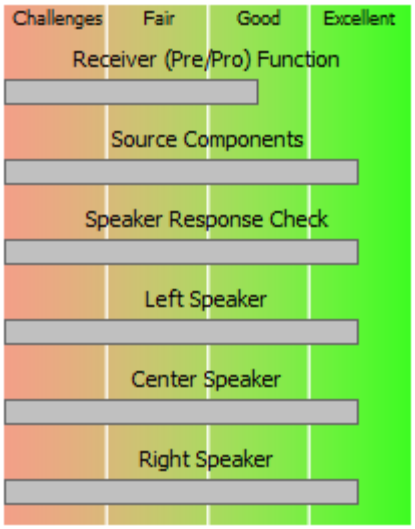

Speaker Response Check

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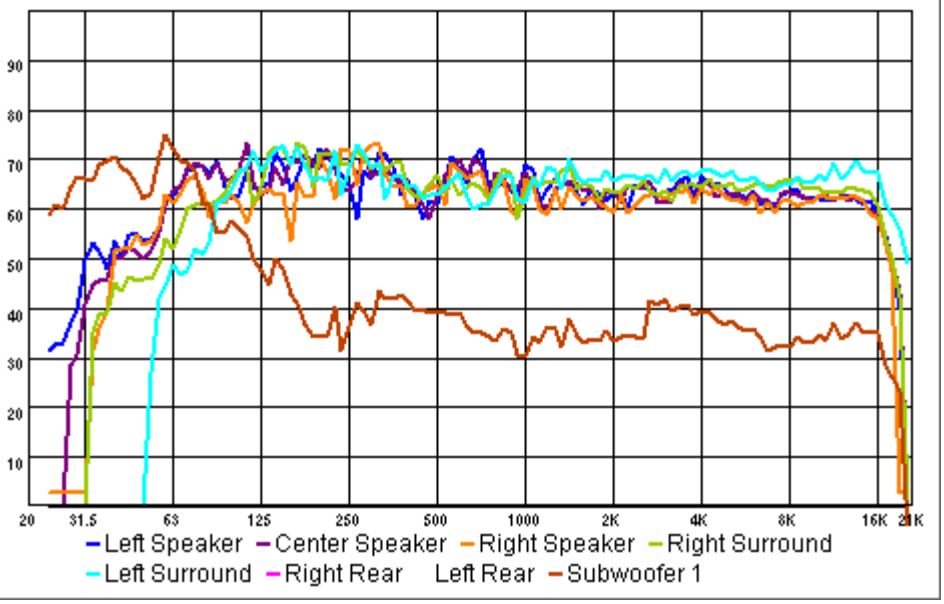

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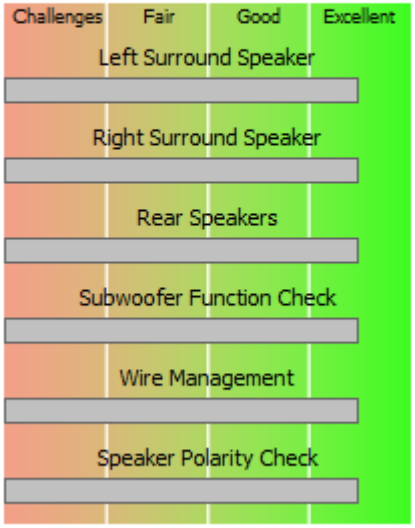
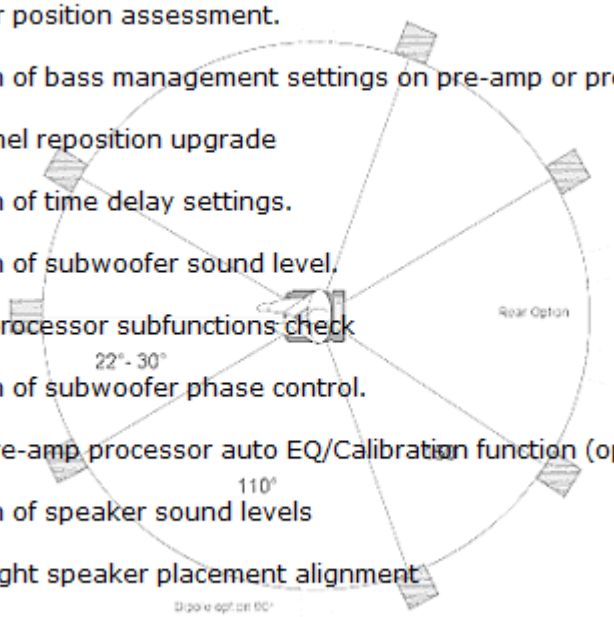


continued

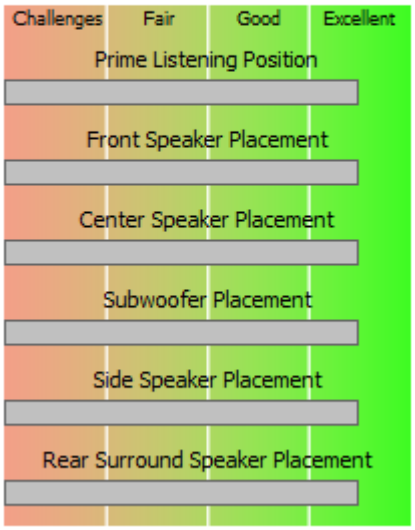
What was done...

- Subwoofer position assessment.
- Calibration of bass management settings on pre-amp or processor.
- Side channel reposition upgrade
- Calibration of time delay settings.
- Calibration of subwoofer sound level.
- Pre-amp/processor subfunctions check
- Calibration of subwoofer phase control.
- Run the pre-amp processor auto EQ/Calibration function (optional)
- Calibration of speaker sound levels
- Left and right speaker placement alignment
- Speaker response measurements



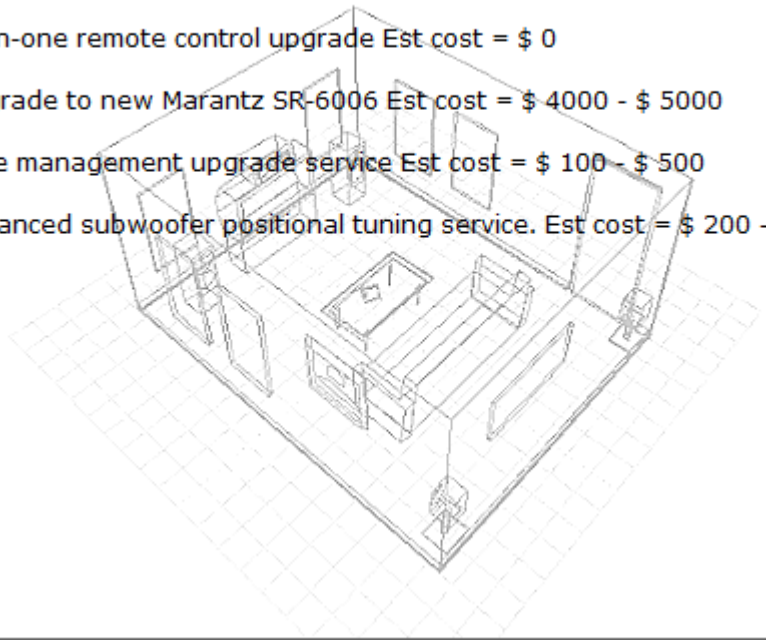
Design Review

Known as the acoustical framework of a system; proper alignment of speakers and listeners is the most cost effective way to maximize performance.



Recommendations

- Speaker cable upgrade Est cost = $ 230
- All-in-one remote control upgrade Est cost = $ 0
- Upgrade to new Marantz SR-6006 Est cost = $ 4000 - $ 5000
- Wire management upgrade service Est cost = $ 100 - $ 500
- Advanced subwoofer positional tuning service. Est cost = $ 200 - $ 500



HAA TurboCal Master Report

Acoustical Analysis Report

Audio Calibration for Home Theater

HAA definition of a System: The chain of components from source through amplification, speakers and finally including the last critical link in the chain; the listening room. All are part of the final performance picture and are integral components of the system. This analysis report focuses on the room component of the system and how well the other components are integrated into a balanced properly designed home theater.

The Home Acoustics Alliance (HAA®) has developed the TurboCal Audio Calibration Report for Home Theater to be a qualitative review of the design, system functionality, and tuning of a home theater system. The various "Elements" that outline the framework for a properly calibrated system have been reviewed and graded based upon how well they conform to the industry standards. We refer to this process as Sound Quality Management or (SQM). The grades provide a relative scale to judge success but are strictly based on the opinion of the individual calibrator performing your calibration. This "Master Report" is an expanded review of the system and contains the same evaluation data as the HAA TurboCal Summary report. It's recommended that you review the report with the calibrator to fully understand the implications of their findings and any terms or graphs. Keep in mind that the report evaluates the system at a point in time. As with all complex systems it's important to update the calibration from time to time to keep sound quality the best it can be.

Clarity

System exhibits intelligible dialogue, easily audible low level detailing, and instrumental

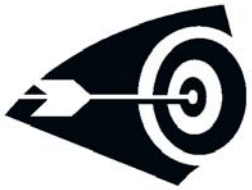

Clarity

Clarity is the prime acoustical quality because its perfection depends on the successful attainment of all other goals. Of paramount importance is dialogue intelligibility in movies, but one must be able to understand musical lyrics, detect quiet background details, and sense realism for acoustical sounds. Elements that affect this goal are varied including equipment quality, room reverberation levels, ambient noise levels, and listener position among others. Clarity is paramount in defining the performance of a home theater system.

Observed system clarity can be further improved by equipment changes detailed later in the report.

Focus

System exhibits precise localization, image stability, and realistic instrument image dimensioning.

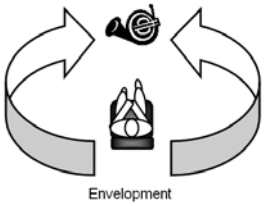

Focus

The ability to precisely locate each reproduced sonic cue or image in a three-dimensional space is defined as acoustical focus. Recordings contain many such images superimposed side to side and front to back in every direction for 360 degrees around the listener. A system is said to have pin-point focus if, from the perspective of the listener, each of these images is properly sized, precisely located, and not wandering. Good focus also provides that individual images be easily distinguishable from amongst others within the limits of the recordings quality.

Observed system focus was excellent!

Soundstage Envelopment

System exhibits a realistic sense of imaging depth, a seamless soundstage and a cohesive sense of envelopment at all angles.

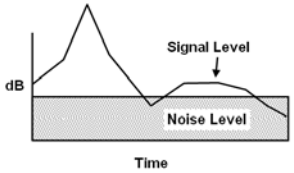


An audio system should reproduce virtual images of each recorded sound presenting the listener with its apparent source location in a three-dimensional space. Each sonic image relates a part of the recorded event and together these sounds compose a wrap-around soundstage that envelopes the listener. Proper envelopment requires that the soundstage be seamless for 360 degrees without interruption by holes or hot spots caused by speaker level imbalance or poor placement. While envelopment requires three-dimensional imaging of all sonic cues, of pivotal importance is the realistic recreation of the ambient sound field of the recorded venue. Focused sounds become more realistic as they move side to side and front to back with the backdrop of the ambient sounds of the intended venue.

Observed system envelopment was good but could be improved by design recommendations detailed later in the report.

Dynamics

System exhibits a sense of ease at high sound levels and a sense of subtlety during quiet passages; in addition, dynamic contrasts provide a sense of realism.

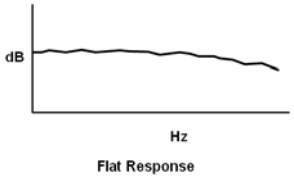


Dynamics is simply defined as the difference between the softest and loudest sounds reproducible by a sound system. While much emphasis is placed on the loudness side, it can be shown that the audibility of the softest sounds is an equal measure of system performance. Among the acoustical requirements for proper envelopment, focus and clarity is the necessity of hearing the sonic cues relating these qualities. If they are overwhelmed by excessive ambient noise or reverberation in a room, they are not properly audible. At a minimum, a system must be capable of reproducing loud passages with ease and without excess while soft sounds remain easily audible.

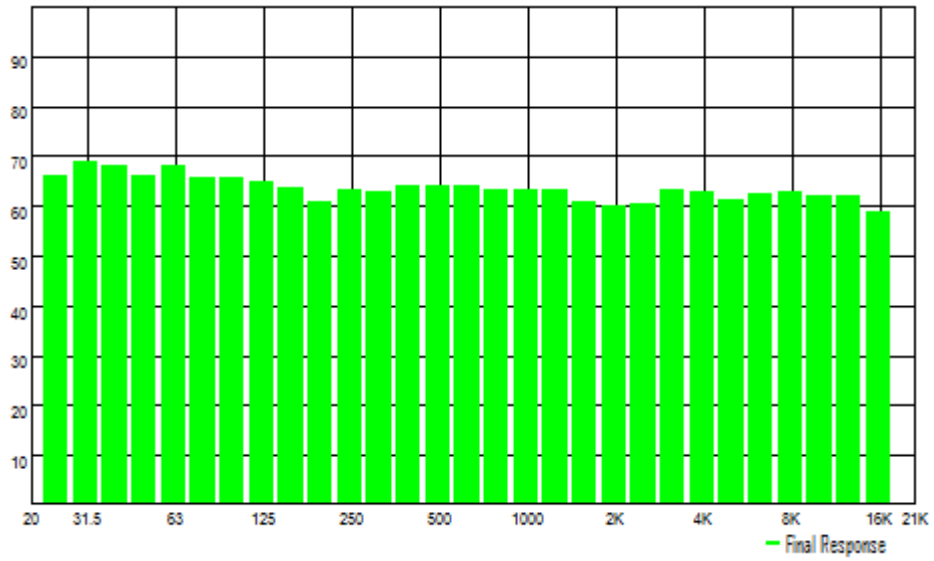
Still slightly harsh at high vocal frequencies

Smooth Response

System exhibits a realistic sense of timbral accuracy, smoothness, and tonal extension in both frequency extremes.



The frequency response of a system is a measurement of the relative levels of all reproduced audio frequencies. The smoothness of response can be observed in a variety of ways; as improper tonal balance including boomy bass, excessive treble, improper musical timbre, or a general lack of realism. Factors of importance include selection of high quality components, and proper system set-up including (in a small room) proper listener position, speaker position, and correct use of equalization. At a minimum, the system must be non-fatiguing all sound levels, articulate and faithful to the original signal.

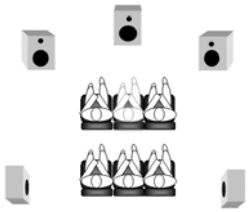


Listening Position Response

Listening is the true final measurement standard, but a system response plot reveals issues we can't always define by ear. The technician uses the plot to identify design and calibration issues that need to be addressed and then see the resulting

Seat-to-Seat Consistency

From seat to seat and row to row the experience should always be satisfying

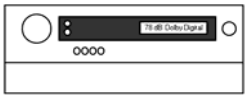


This is perhaps the defining difference between a large and small acoustical space. The small rooms home theaters typically occupy create wide variations in bass response and the close proximity of speakers to listeners can be devastating to focus and envelopment. A properly designed room includes the right number of seats that can fit inside the best listening areas where the smoothest bass and best speaker balance can be achieved.

Observed system performance at primary listening position was optimized. Secondary positions have challenges.

Receiver (Pre/Pro) Function

Receiver is working properly and all settings have been optimized for best performance.



Verification of not only the proper operation of the receiver or pre-amp processor is not only a good idea; it can be time saver. All primary receiver audio functions are verified as being factory correct and then tuned to the correct settings to facilitate the calibration process.

Pre-amp/Processor appears to have the following functional issue: Harshness at higher frequencies when volume high

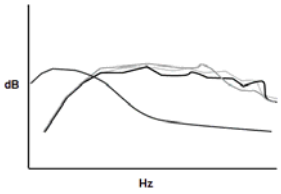
Source Components

All primary source components are working and are properly connected.

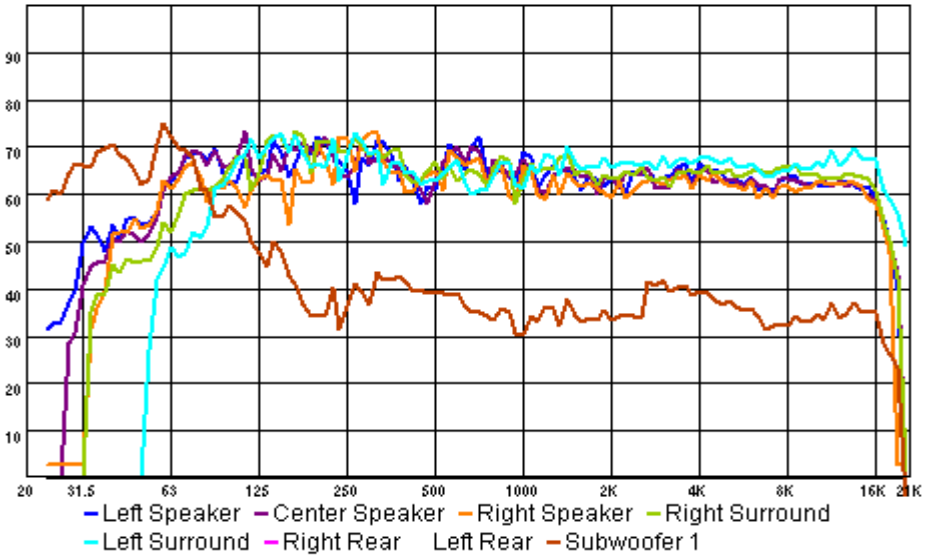
Part of the value of a professional audio calibration is the peace of mind derived from knowing that each of the components has been checked for correct function. The calibrator checks each source component including Blue Ray, DVD, games etc to make sure they are functioning and that they are properly connected to the receiver.

Speaker Response Check

All speakers are working properly and crossovers are correctly set.



Each speaker should be evaluated to show that all drivers are functioning and that processor crossovers are correctly set. Each speaker is measured and it's plot is superimposed on the others for analysis. A good set of plots will not be perfectly smooth but should show a reasonable similarity for "like" speakers. In addition, the subwoofer should show reasonable smoothness but we are primarily looking for it's curve to begin to roll of at the correct point near the crossover frequency.



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Left Speaker

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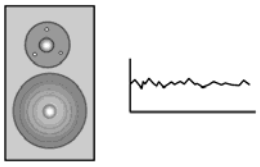
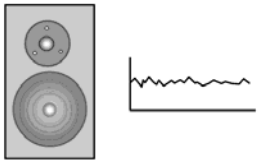


Listening to a speaker to confirm operation is an incomplete approach. Problems with various settings and performance of the speaker might still allow it to produce sound. Even a defective speaker may pass the "working" test but may still have inherent defects that limit its sound quality. The speaker check utilizes real time analysis to visualize the true output of the speaker allowing analysis and comparison to other speakers in the system. This check is the best assurance that the product is working as promised by the manufacturer.

The speaker response check confirms proper operation of all drivers and the correct settings for crossovers. A good result should show reasonable agreement between all main speaker plots, the correct crossover between sub and main speakers, and good smoothness.

Center Speaker

Center speaker is properly functioning within factory specifications.



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Right Speaker

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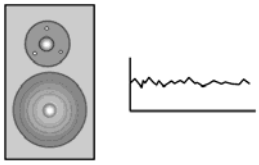

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Binding post replaced

Left Surround Speaker

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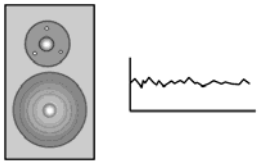

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Right Surround Speaker

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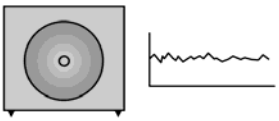

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Tweeter out of phase - replaced speaker

Rear Speakers

Left and right rear speakers are properly functioning within factory specifications.

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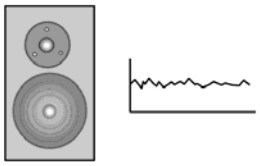
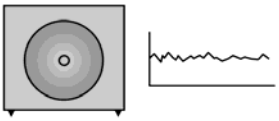


Subwoofer Function Check

Subwoofers are properly functioning within factory specifications.



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Wire Management

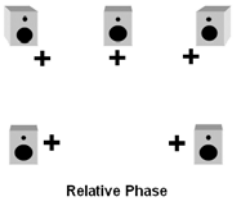
Cables and interconnects are properly installed and of high quality

Proper cabling and wire management is a fundamental part of a well design hom theater system. Management means that the cables are neatly laid out enabling timely servicing and correct connections. The use of the right cable for each function means that the cable is of high quality, reliable over time and delivers the best possible performance. A review of cables and interconnects often finds potential problems and assures teh best possible performance maximizing the value of the other high quality components.

- Speaker cable upgrade
- Wire management upgrade service

Speaker Polarity Check

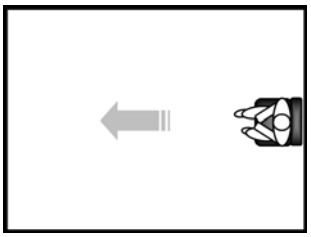
Verification of the proper polarity of each driver in each speaker



While the every part of the verification process is important, even the finest system will fail the sound quality test if not properly polarized. All speakers must be in the same relative phase to create proper focus and clarity. This test assures correct phasing of a speaker acoustically rather than simply depending on correct wiring since other factors can render a speaker out of phase. Speakers can be and many times are manufactured improperly and the problem can be readily identified and corrected by this test.

Prime Listening Position

Prime listening position is properly positioned for optimum focus, envelopment, and bass response.



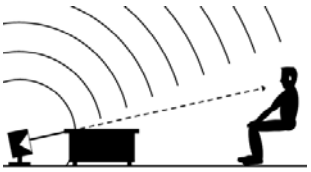
The proper positioning of all speakers is a key to a high performance result but it is based upon where the prime listener is located. This chicken and egg relationship means that the place where you listen is a fundamental element in the system design. Besides lending itself to the proper alignment of all speakers the listening seat must be away from walls and not too close to any speaker. Many times, a subtle movement away from a back wall or away from the center of the room can make a huge difference in the performance.

Seating was properly placed to allow best sound quality performance.

Front Speaker Placement

Front speakers are wholly visible from all listening locations (unobstructed direct sound).

While it may seem like an obvious requirement, one of the most common speaker placement errors results in one or more of the front speakers being blocked. The most common culprit is the center channel behind a coffee table or placed too low for a clear transmission of sound. An effort must be made to keep all speakers within a direct line of sight form every listener.



Coffee table blocks direct sound

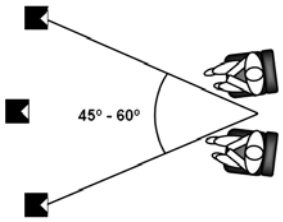
Front speakers are properly placed and toe-in angle has been optimized for best performance.

Acoustical Analysis Report

HAA TurboCal continued from previous page

Center Speaker Placement

Front left and right speakers should be separated by 45° to 60° degrees from center of listening area.

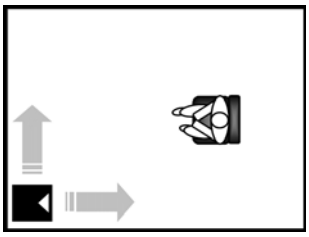


The best home theater layout is one that matches the layout of the original post-production soundstage. The recreation involves more than using high quality monitoring equipment. The proper soundstage perspective depends on matching the same imaging presentation originally used by the movie sound engineers. The standard for movie work as provided by ITU and SMPTE is 45° to 60° degrees as shown here. Deviations from this can yield a dull monophonic presentation if too shallow or an non-cohesive image if too far apart.

Center speaker is perfectly placed for best soundstage and dialog.

Subwoofer Placement

Subwoofer should be properly placed in the optimum position for smooth response

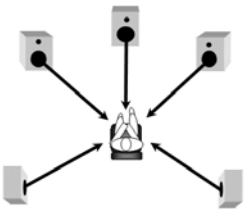


The proper placement of a subwoofer can be elevated to a highly technical and involved process which is beyond the scope of the TurboCal. Some basic rules though can be applied. In particular, that placing a sub in the corner is almost never the best option for a smooth bass response. The slight repositioning of the sub away form the corner can often greatly increase sound quality. In cases where the sub has insufficient output for the space, corner placement may have merit, but a better choice is to upgrade the subwoofer. This assessment will determine the need for more advanced work to properly tune the subwoofer.

- Advanced subwoofer positional tuning service.

Side Speaker Placement

Side surround speakers should be placed to enhance sound field envelopment while limiting speaker localization.

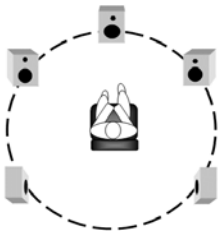


The side surround speakers are designed to enhance the sound stage envelopment of the front speakers and provide a source for additional imaging effects beside and behind the listeners. Proper placement will assure a seamless blending with the front speakers while minimizing the chance that a nearby listener will localize the speaker as the sonic source. Called the "exit door effect", such a localization collapses the enveloping soundstage greatly diminishes sound quality.

Speakers raised above seating position

Rear Surround Speaker Placement

Rear surround speakers should be placed to enhance sound field envelopment while limiting speaker localization.



The rear surround speakers are designed to enhance the sound stage envelopment of the front speakers and provide a source for additional imaging effects behind the listeners. Proper placement will assure a seamless blending with the side speakers while minimizing the chance that a nearby listener will localize the speaker as the sonic source. Called the "exit door effect", such a localization collapses the enveloping soundstage greatly diminishes sound quality.

Speakers raised above seating position

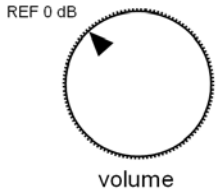
HAA TurboCal Master Report

Acoustical Analysis Report

HAA TurboCal continued from previous page

Reference Level

The correct sound level for music or movie listening for a system is calibrated as reference on pre/pro settings.

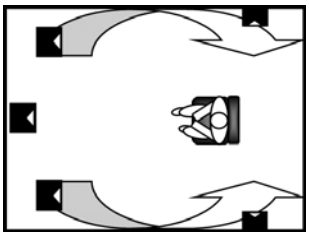


The true reference level of a sound system is based upon the material it is playing. Movies for example have well known calibration standards so the theatrically correct sound levels can be set for any theater. In a home theater, the preferred sound level may be lower than true reference due to customer preferences but often due to the limitation of the systems dynamic capabilities. This element focuses on calibrating the preferred sound level as system reference.

Approx 6dB down

Speaker Levels

All main speakers, including the front, side and rears, should have precisely matched sound levels to achieve proper sonic envelopment.

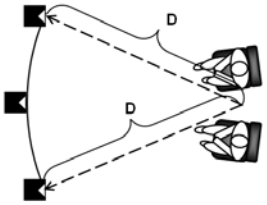


A good sounding system is a result of the perfect interaction between all channels of sound. The absence of one channel or the dominance of another eliminates this fine balance. The result is a loss of the creation of a new sonic atmosphere; a virtual space that convinces out sense that we are in a different space. This is the basis of the "suspension of disbelief" that is the hallmark of a great sound system. The calibration of sound levels is a fundamental requirement in achieving this illusion.

Speaker sound levels have been tuned for optimized results.

Speaker Phase

The phase of all channels has been precisely time aligned to allow precision focus and response smoothness.

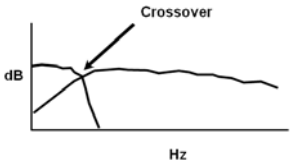


Phase alignment is often called setting time delay . Its function is commonly misunderstood or over simplified. The proper time alignment of all speakers is imperative to allow precision imaging and to keep low frequency signals from the various speakers smoothly reinforcing each other.

Time delay adjustment has been optimized and verified.

Subwoofer Sound Level

Subwoofer sound level is precisely calibrated to smoothly integrate with main speakers.



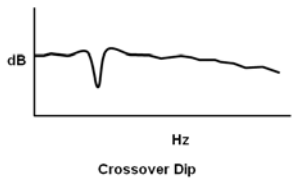
Subwoofers are much more than a device to add punch or impact to a sound track. They are an integral part of the sound quality equation. Correct subwoofer integration enhances every aspect of sound quality from bass smoothness to enhanced focus. The calibration of a subwoofer requires smoothing its response and a finely tuned sound level to complete the acoustical picture.

Subwoofer sound level has been optimized.

Subwoofer Phase

Subwoofer phase alignment has been calibrated to allow a smooth response transition across the crossover frequency.

As with each of the main speakers correct phase alignment is critical. While the subwoofer interacts only in a narrow band of frequencies about the crossover, it alignment is no less important. Properly aligned subwoofer phase is evidenced by how the response looks at the crossover; a dip in level is a clear indication that the subwoofer is not calibrated.



Crossover Dip

Subwoofer phase alignment has been optimized. A separate equalizer could allow better alignment. Recommend discussion on upgrading the subwoofer or pre-amp/processor to one with more sophisticated time delay adjustability,

System Performance Report Card

Acoustical Analysis Report

TurboCal Sonic Performance Review

HAA definition of a System: The chain of components from source through amplification, speakers and finally including the last critical link in the chain; the listening room. All are part of the final performance picture and are integral components of the system. This analysis report focuses on the room component of the system and how well the other components are integrated into balanced properly designed home theater.

The system report card reveals the cumulative scoring of the acoustical performance of your home theater. Achievement of these goals defines success in a properly designed and calibrated system. The proper alignment of the acoustical elements reviewed during this calibration is how we improve our scores. Consult the Master Report for a detailed discussion of the calibration elements reviewed for this report.

Clarity

Score B

Clarity is the prime acoustical quality because its perfection depends on the successful attainment of all other goals. Of paramount importance is dialogue intelligibility in movies, but one must be able to understand musical lyrics, detect quiet background details, and sense realism for acoustical sounds. Elements that affect this goal are varied including equipment quality, room reverberation levels, ambient noise levels, and listener position among others. Clarity is paramount in defining the performance of a home theater system.

Focus

Score B

The ability to precisely locate each reproduced sonic cue or image in a three-dimensional space is defined as acoustical focus. Recordings contain many such images superimposed side to side and front to back in every direction for 360 degrees around the listener. A system is said to have pin-point focus if, from the perspective of the listener, each of these images is properly sized, precisely located, and not wandering. Good focus also provides that individual images be easily distinguishable from amongst others within the limits of the recordings quality.

Soundstage Envelopment

Score B

An audio system should reproduce virtual images of each recorded sound presenting the listener with its apparent source location in a three-dimensional space. Each sonic image relates a part of the recorded event and together these sounds compose a wrap-around soundstage that envelopes the listener. Proper envelopment requires that the soundstage be seamless for 360 degrees without interruption by holes or hot spots caused by speaker level imbalance or poor placement. While envelopment requires three-dimensional imaging of all sonic cues, of pivotal importance is the realistic recreation of the ambient sound field of the recorded venue. Focused sounds become more realistic as they move side to side and front to back with the backdrop of the ambient sounds of the intended venue.

Dynamics

Score B

Dynamics is simply defined as the difference between the softest and loudest sounds reproducible by a sound system. While much emphasis is placed on the loudness side, it can be shown that the audibility of the softest sounds is an equal measure of system performance. Among the acoustical requirements for proper envelopment, focus and clarity is the necessity of hearing the sonic cues relating these qualities. If they are overwhelmed by excessive ambient noise or reverberation in a room, they are not properly audible. At a minimum, a system must be capable of reproducing loud passages with ease and without excess while soft sounds remain easily audible.

Smooth Response

Score B

The frequency response of a system is a measurement of the relative levels of all reproduced audio frequencies. The smoothness of response can be observed in a variety of ways; as improper tonal balance including boomy bass, excessive treble, improper musical timbre, or a general lack of realism. Factors of importance include selection of high quality components, and proper system set-up including (in a small room) proper listener position, speaker position, and correct use of equalization. At a minimum, the system must be non-fatiguing all sound levels, articulate and faithful to the original signal.

Seat-to-Seat Consistency

Score B

This is perhaps the defining difference between a large and small acoustical space. The small rooms home theaters typically occupy create wide variations in bass response and the close proximity of speakers to listeners can be devastating to focus and envelopment. A properly designed room includes the right number of seats that can fit inside the best listening areas where the smoothest bass and best speaker balance can be achieved.