The Calibration of Your System

ACOUSTICAL ANALYSIS REPORT

Acoustic Calibration Review 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 performance analysis report focuses on the alignment of all elements within the system, integrated into a balanced properly calibrated home theater.

The Home Acoustics Alliance (HAA®) has developed the Acoustic Calibration Review (ACR) for Home Theater to be a quantitative review of the performance of a home theater system. The various "Elements" that outline the framework for a properly designed system are measured or listened to by the acoustical calibrator and graded based upon how well they conform to industry standards. The grades provide a relative scale to judge the final success of calibration after installation. This analysis also includes the evaluation of equipment functionality, connections and other basic elements necessary to assure the high end performance of the system. For the total performance evaluation, the ACR establishes the required calibration elements and the Acoustic Design Review (ADR) orchestrates the design elements. This APR section of the report will show if these elements of the system are properly tuned for high performance results. The final combined Acoustic Performance Report will factor in both design and calibration elements for the final review.

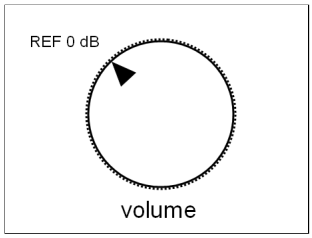
ABOUT YOUR SCORE:
The grading scale devised for this analysis is based upon a four point system: The score of "A" means that your system complies and high end performance will not be restricted based upon this element's influence. A score of "B" means that your system does not fully comply with the element specification and it may begin to have some impact on sonic performance. A score of "C" is where changes to the system are recommended to bring the performance up to a high end level. A score of "D" means that the element does not comply with system standards and the current design is strongly recommended to be changed if possible.

Element *1*

REFERENCE SOUND LEVEL FOR THEATRICALLY CORRECT LOUDNESS HAS BEEN CALIBRATED TO PROVIDE OPTIMUM SYSTEM PERFORMANCE AND IN ACCORDANCE TO CUSTOMER PREFERENCES.

Score Before Calibration: **B**

The use of a reference sound level is fundamental to critical listening. The proper auditioning of audio components, audio software, and acoustical adjustments demands comparisons using consistent listening levels. For home sound systems, the determination of this proper level depends on personal preferences, typical software choices and limitations imposed by the system itself. Listeners should use the reference level set by the calibrator during the calibration process for the most satisfying listening experience.



RECOMMENDATION: The reference sound level has been set to 85 dB to provide optimum system performance and to meet customer requirements.

Result: This performance element has been improved

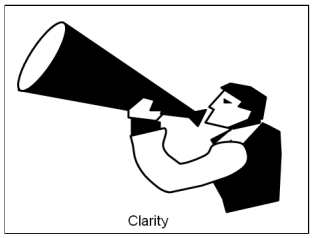
Score After Calibration: **A**

Element *2*

PRIMARY SEATING LISTENING TEST: SYSTEM EXHIBITS INTELLIGIBLE DIALOGUE, EASILY AUDIBLE LOW LEVEL DETAILING, AND INSTRUMENTAL CLARITY.

Score Before Calibration: **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.


Clarity

RECOMMENDATION: The system already exhibited intelligible dialogue, easily audible low level detailing and instrumental clarity but this was improved further by calibration.

Result: This performance element has been improved

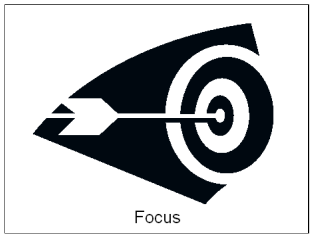
Score After Calibration: **A**

Element *3*

PRIMARY SEATING LISTENING TEST: SYSTEM EXHIBITS PRECISE LOCALIZATION, IMAGE STABILITY, AND REALISTIC INSTRUMENT IMAGE DIMENSIONING.

Score Before Calibration: **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.


Focus

RECOMMENDATION: The system exhibited reasonably precise localization, image stability and realistic instrument image dimensioning but this was improved further by calibration.

Result: This performance element has been improved

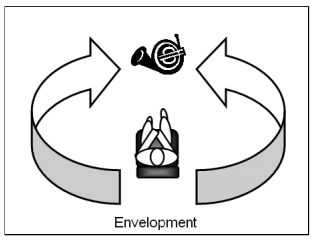
Score After Calibration: **A**

Element *4*

PRIMARY SEATING LISTENING TEST: SYSTEM EXHIBITS A REALISTIC SENSE OF IMAGING DEPTH, A SEAMLESS SOUNDSTAGE AND A COHESIVE SENSE OF ENVELOPMENT AT ALL ANGLES.

Score Before Calibration: **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 with the backdrop of the ambient sounds of the intended venue.


Envelopment

RECOMMENDATION: The system exhibited a reasonably realistic sense of imaging depth, a seamless soundstage and a cohesive sense of envelopment at all angles but this was further improved by calibration.

Result: This performance element has been improved

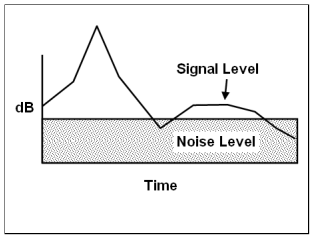
Score After Calibration: **A**

Element *5*

PRIMARY SEATING LISTENING TEST: 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.

Score Before Calibration: **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.



RECOMMENDATION: The system already exhibited a sense of ease at high levels and a sense of subtlety during quiet passages but this was further improved by the calibration process.

Result: This performance element has been improved

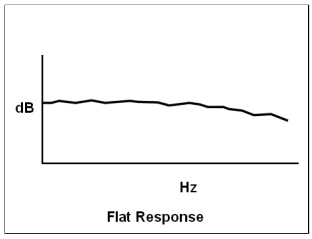
Score After Calibration: **A**

Element *6*

PRIMARY SEATING LISTENING TEST: SYSTEM EXHIBITS A REALISTIC SENSE OF TIMBRAL ACCURACY, SMOOTHNESS, AND TONAL EXTENSION IN BOTH FREQUENCY EXTREMES.

Score Before Calibration: **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.



RECOMMENDATION: The system exhibited a reasonably realistic sense of timbral accuracy, smoothness and tonal extension in both frequency extremes but this was further improved by calibration.

Result: This performance element has been improved

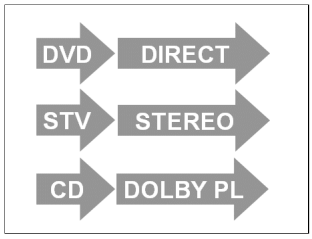
Score After Calibration: **A**

Element *12*

AV PROCESSOR INPUTS AND SOURCE OUTPUTS ARE PROPERLY SETUP COORDINATED FOR INPUT TYPE, CHANNELS, AND PREFERRED DECODING SYSTEM.

Score Before Calibration: **A**

A simple enough requirement, but in many systems the setup of a sophisticated DVD player and the selected processor input are not coordinated. Adjustments can include codec preferences; source based time delays, digital format, and even preferred number of channels. Selections should be based upon customer preferences and optimized performance. While many processors have automated this function, a properly setup system will have all inputs checked and working logically for ease of use.



RECOMMENDATION: The AV processor inputs and source outputs are properly setup and no further adjustments are necessary.

Result: No significant change in this element

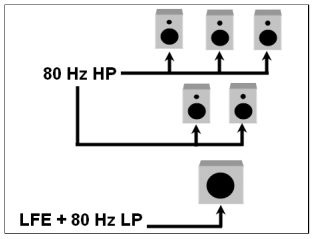
Score After Calibration: **A**

Element *14*

AV PROCESSOR SPEAKER SETUP MATCHES CURRENT CONFIGURATION AND BASS MANAGEMENT SETTINGS ARE CORRECT.

Score Before Calibration: **A**

A modern AV processor offers a myriad of setup options which can be unique to each source. These options include setting small or large on speakers, various subwoofer settings, default decoding options and even the labels of the source inputs. A common problem in systems is that these setting have either never been properly set or are accidentally changed by errant remote control use. Once the processor is properly set it is advisable to switch to a specially programmed after-market remote like a Pronto or Crestron that only offers the controls necessary for everyday use of the system. This should minimize unwanted changes in processor settings.



RECOMMENDATION: The A/V processor speaker setup matches the current configuration and the bass management settings are correct, no further adjustments are necessary.

Result: No significant change in this element

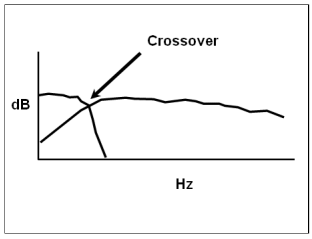
Score After Calibration: **A**

Element *15*

AV PROCESSOR CROSSOVER SETTING IS CORRECT (80 HZ RECOMMENDED) AND SUBWOOFER CROSSOVER IS OFF OR SET ABOVE 130 HZ.

Score Before Calibration: **A**

State of the art AV processors contain controls for managing the flow of bass information to various speakers. The introduction of the subwoofer and the benefits it offers makes proper setup of this control important. A subwoofer setting of "On" usually only allows Low Frequency Effects (LFE) to be sent to the sub. These effects require the subwoofer to play frequencies of up to 125 Hz. Setting the speakers to "Small" turns the crossover on in the processor and vents the low frequency information of the respective channel to the sub. A better term than "Small" would be "Crossover On" irrelevant of the size of the speaker since in some cases use of a crossover is useful even for large speakers.



RECOMMENDATION: The AV processor crossover setting is correctly set to 80 Hz and the subwoofer crossover is off, no further adjustments are necessary.

Result: No significant change in this element

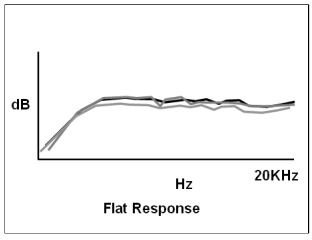
Score After Calibration: **A**

Element *16*

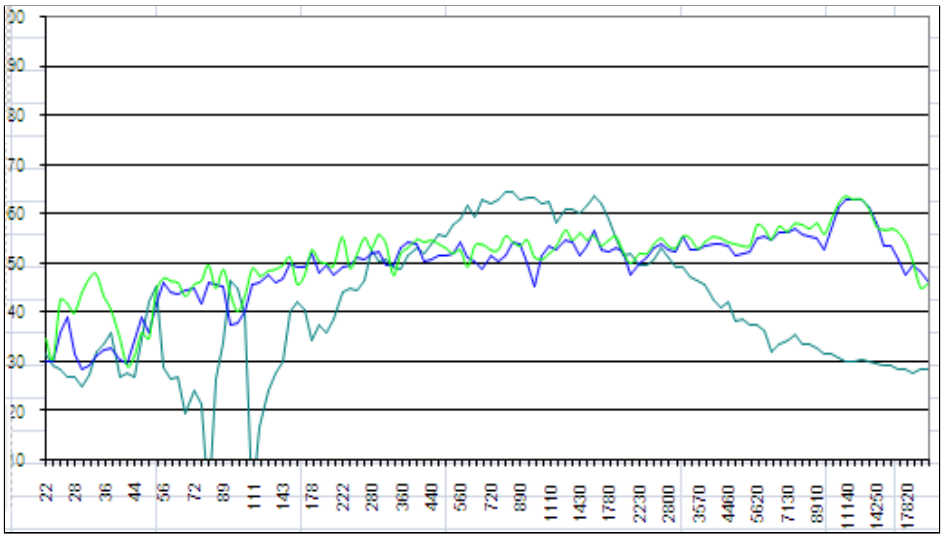
LCR SPEAKERS NEAR FIELD RESPONSE PLOTS ARE SIMILAR AND ARE WITHIN PARAMETERS EXPECTED FOR THE SPEAKER IN QUESTION.

Score Before Calibration: **B**

The measurement of the "near field" response of a speaker is the field test version of measuring a speaker in a test chamber called an anechoic room. The value of the test is that it gives a view of the true response of the speaker and crossover while minimizing the rooms' acoustical distortions. It serves as a quality control factor since any malfunctioning components in the speaker can be easily detected. It also allows the calibrator to compare "like" speakers as a further "QC" check. A side benefit of the resulting response plots is to use this plot as a standard of comparison for the measurement taken at the listening position. Deviations can be explained by looking at various acoustical effects and thus the near field becomes our prototype "target response plot".



RECOMMENDATION: The left and right speakers show near field response plots that are to be expected of a floor standing full range speaker. The center speaker shows a poor response that might be the result of a problem with the speaker, however the low and high resolution measurements taken from the listening position seem much better and thus it might just be a bad reading.



Result: No significant change in this element

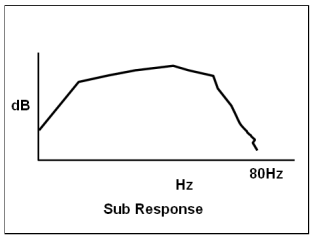
Score After Calibration: **B**

Element ***17***

SUBWOOFER NEAR FIELD RESPONSE PLOTS ARE WITHIN PARAMETERS.

Score Before Calibration: **A**

The measurement of the "near field" response of a subwoofer is the field test version of measuring it in a test chamber called an anechoic room. The value of the test is giving a view of the true response of the speaker and crossover while minimizing the rooms' acoustical distortions. It serves as a quality control factor since any malfunctioning components in the speaker can be easily detected. In the case of the subwoofer, a good plot shows deep roll off frequency and flat response. A side benefit of the resulting response plots is to use this plot as a standard of comparison for the measurement taken at the listening position. Deviations can be explained by looking at various acoustical effects and thus the near field becomes our prototype "target response plot".



RECOMMENDATION: The subwoofer showed a near field response plot that was within the parameters of the speaker being tested.

Result: No significant change in this element

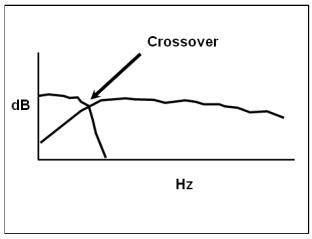
Score After Calibration: **A**

Element ***18***

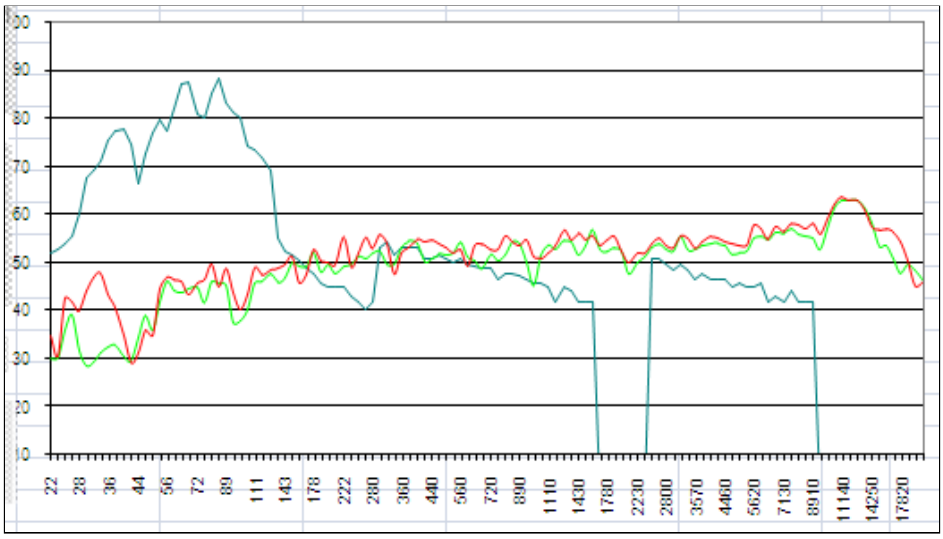
SUBWOOFER/MAIN CROSSOVER FREQUENCY IS WITHIN PARAMETERS.

Score Before Calibration: **B**

The overlaid "near field" responses of speakers is an excellent indicator of the quality of the crossovers used in either the processor or the speakers themselves. Correct parameters usually show the sound level at crossover frequency to be about 3 dB lower than in the operating range of the speaker. A poorly setup or designed crossover might also show an improper sloping of the response after the crossover frequency. Typically the subwoofer should demonstrate a sharper slope than the main speakers and an overlay of the two should depict an intersection of the plots very nearly at the calibrated crossover point. Tunable crossovers such as in subwoofers must be verified using this technique as analog frequency controls are often wrong.



RECOMMENDATION: The subwoofer/main crossover frequency seems to be higher than the 80 Hz set in the processor, this is probably due to the sub being set too loud at the time of the test.



Result: This performance element has been improved

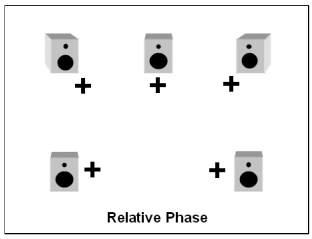
Score After Calibration: **A**

Element *19*

ALL MAIN SPEAKERS ARE IN SAME RELATIVE PHASE.

Score Before Calibration: **A**

Each speaker in the system must be in the same phase. For main speakers the resulting cancellation is clearly audible yet the uninitiated might never realize the problem. The out of phase interaction of two speakers yields a cancellation of the all-important direct sound thus a significant reduction in focus and clarity. In full-range speaker systems a reduction in bass is also a tip-off. High performance is not possible if any speaker is not properly phased in the system.



RECOMMENDATION: All the main speakers are in the same relative phase.

Result: No significant change in this element

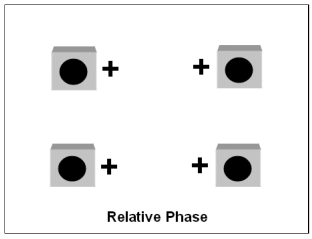
Score After Calibration: **A**

Element *20*

ALL SUBWOOFERS ARE IN SAME RELATIVE PHASE.

Score Before Calibration: **A**

Each speaker in the system must be in the same phase. For subwoofers the resulting cancellation is less clearly audible yet the reduction in output can significantly diminish deep bass dynamics. The out of phase interaction of two speakers yields a cancellation of the all-important direct sound thus a significant reduction in output. All speakers playing the same frequency ranges must be in phase with each other. Any use of the subwoofer phase switch to reverse phase must be changed identically on all subwoofers to avoid this problem. High performance is not possible if any speaker is not properly phased in the system.



RECOMMENDATION: There is only one subwoofer in this system.

Result: No significant change in this element

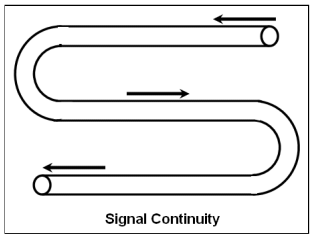
Score After Calibration: **A**

Element *21*

ALL SPEAKER AND INTERCONNECT CABLES ARE HIGH QUALITY, FUNCTIONAL, AND INSTALLED USING PROFESSIONAL WIRE MANAGEMENT TECHNIQUES.

Score Before Calibration: **A**

The proper operation of audio components requires quality cabling that exhibits continuity at both DC and audio frequencies. Simply put; the wires must allow signal flow. The use of professional wire management techniques do not directly affect acoustical performance, yet the confirmation of correct installation including phase and routing is greatly complicated by clutter. It is worth the expense to have a qualified technician label, tie and arrange wiring in the system.



RECOMMENDATION: All the speaker and interconnect cables are high quality and installed using professional wire management techniques.

Result: No significant change in this element

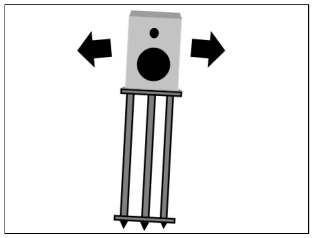
Score After Calibration: **A**

Element ***22***

ALL SPEAKERS OR SPEAKER STANDS ARE ADJUSTED TO BE LEVEL AND STABLE.

Score Before Calibration: **A**

Most speaker stand manufacturers and many full-range speaker companies design their products to be adjustable for proper leveling. While a minor leveling error may be sonically inconsequential, a speaker that is not stable and can rock on its spikes is not optimized. A properly installed system includes all speakers firmly setting on its stand via spikes, leveling screws or a damping mat.



RECOMMENDATION: All speakers are level and stable, no further adjustments are necessary.

Result: No significant change in this element

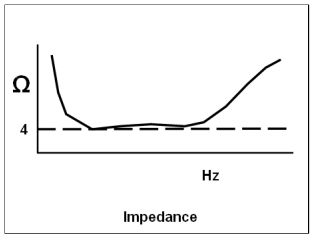
Score After Calibration: **A**

Element ***23***

ALL MAIN SPEAKERS' IMPEDANCE PLOTS SHOW NO DROPS BELOW SPEAKER SPECIFICATIONS OR 4 OHMS.

Score Before Calibration: **A**

The proper design of a loudspeaker means the equal reproduction of all audible frequencies of sound; otherwise called a flat frequency response. This specification is made more difficult because of the variable impedance or load at different frequencies exhibited by most speakers. This variable load becomes most problematic in the bass range. As the impedance drops the amplifier must produce more current to drive the load. While many high end amplifiers are capable of driving impedances below 4 ohms, most quality speakers are designed to keep load within a nominal range indicated on the speaker specifications. System speakers should be within these specifications, have similar results to each other and unless specifically designed otherwise, be above 4 ohms at all frequencies.



RECOMMENDATION: All the main speakers impedence plots show no drops below the speaker specifications with all speakers rated at 8 ohms.

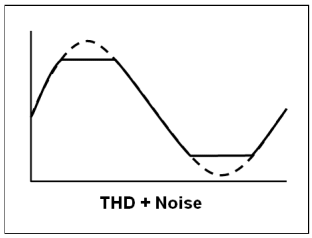
Result: No significant change in this element

Score After Calibration: **A**

Element ***24***

ALL MAIN SPEAKER DRIVERS SHOW DISTORTION MEASUREMENTS WITHIN PARAMETERS.

Score Before Calibration: **A**



Beyond confirming that the sound level of a speaker is correct or flat at all frequencies, it is important to measure the distortion level of each channel. Besides the obvious acoustical distortion in a system, the electronic components and speakers themselves generate distortion. Measured by comparing the input signal to the speakers output, this test indicates if the components are operating properly internally. Some distortions are not obvious to the uninitiated without understanding the true possibilities of system clarity, focus and dynamics. All components begin to noticeably distort at the extreme range of their sound output. This test determines proper operation at normal listening levels.

RECOMMENDATION: The speaker distortion test gave a reading of between 4 and 8% at different frequencies and there were no appreciable differences between the matched speakers.

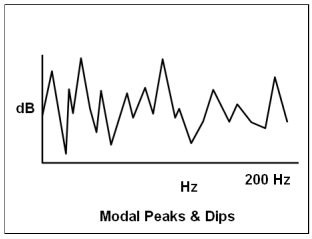
Result: No significant change in this element

Score After Calibration: **A**

Element *25*

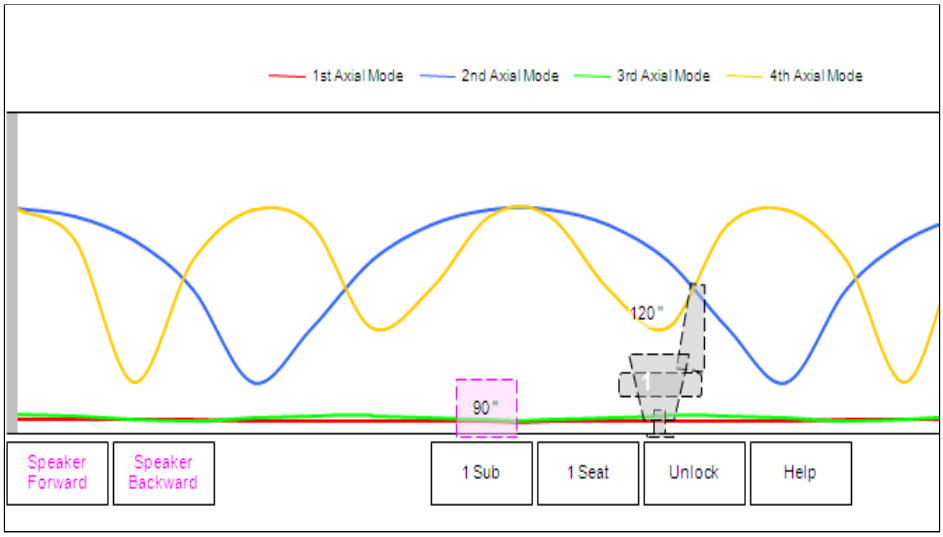
MODE ANALYSIS SHOWS PREVALENT STANDING WAVE FREQUENCIES.

Score Before Calibration: **A**



The measurement of the frequency response of a system is an important thing because it shows how the room is distorting the true output of the speakers. One of the most damaging of these acoustical distortions is caused by standing waves otherwise known as room modes. A calibrator can more efficiently make corrections for these problems if they understand the frequencies and types of modes in a room. In this analysis element, a measurement is completed near a room boundary, usually in a corner, to display the identity of room modes as peaks in the response plot. In a "well behaved" room, the response peaks will generally agree with the predictions of modes calculated using the rooms dimensions.

RECOMMENDATION: The measurements taken at points near the room boundary seem to correspond to the calculated modes based on the room dimensions.



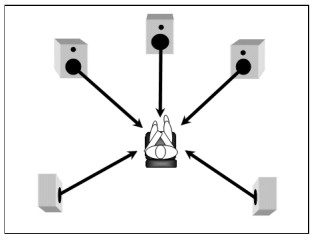
Result: No significant change in this element

Score After Calibration: **A**

Element *26*

ALL SPEAKERS ARE SOUND LEVEL MATCHED AS MEASURED FROM THE CENTRAL LISTENING POSITION.

Score Before Calibration: **B**



The setting of each speaker's sound level is a fundamental calibration element. The correct presentation of the soundstage depends on a balanced interaction between all speakers. Using a test tone, the calibrator will adjust the relative level of each speaker to be identical at the central listening position. Listeners situated too close to any of the speakers in the system will not hear the balanced presentation as well as those situated closer to the central point used for calibration. An enveloping soundstage and correct stereo imaging are not possible without this critical adjustment.

RECOMMENDATION: All the speakers were sound level matched from the central listening position.

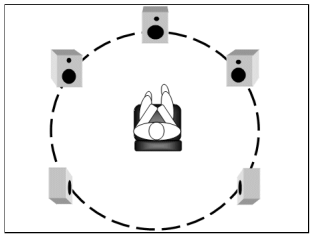
Result: This performance element has been improved

Score After Calibration: **A**

Element ***27***

ALL SPEAKERS ARE EQUIDISTANT FROM THE CENTRAL LISTENING POSITION OR ARRIVAL TIME CORRECTED.

Score Before Calibration: **B**



The distance a speaker is separated from a listener is obviously directly related to the time it takes for the signal to arrive. A sound generated by a speaker located farther away from the listener will arrive late and will not be aligned with the other speaker signals. This misalignment is audible because a "late" signal will be out of phase at certain frequencies. The audible result is an uneven frequency response caused by phase cancellation which is sometimes referred to as "comb filtering". A well designed system will have all speakers equidistant from the central listening position but a reasonable alternative is to correct the arrival time difference by delaying the signal of closer speakers to align them with the "late" arriving more distant speakers.

RECOMMENDATION: The front LCR speakers are equidistant from the central listening position and the side and rear speakers were time arrival corrected.

Result: This performance element has been improved

Score After Calibration: **A**

Element ***28***

SUBWOOFER(S) LEVEL AND PHASE IS SET TO PROVIDE A SMOOTH TRANSITION AT THE CROSSOVER FREQUENCY.

Score Before Calibration: **B**

The sound level of the subwoofer is clearly important. Subwoofers set too loudly or softly will diminish the realism and quality of the performance. For systems employing bass management, meaning using a subwoofer crossover, the adjustment is even more critical. The final response of the system depends on the level of the sub to be identical as the bass signal transitions from the sub to the main speakers. This adjustment is best made using the frequency response plot created by a Real Time Analyzer (RTA) or spectrum analyzer as confirmation. Additionally, any phase difference between main speakers and subwoofers will create an audible problem at the crossover frequency. Such a crossover problem can be reduced by proper and identical setting of the phase switch for all subs.

RECOMMENDATION: The subwoofer's level and phase was set to provide a smooth transition at the crossover frequency as shown in the 1/3 octave frequency response taken from the primary listening position compared to the original near field response.

Result: This performance element has been improved

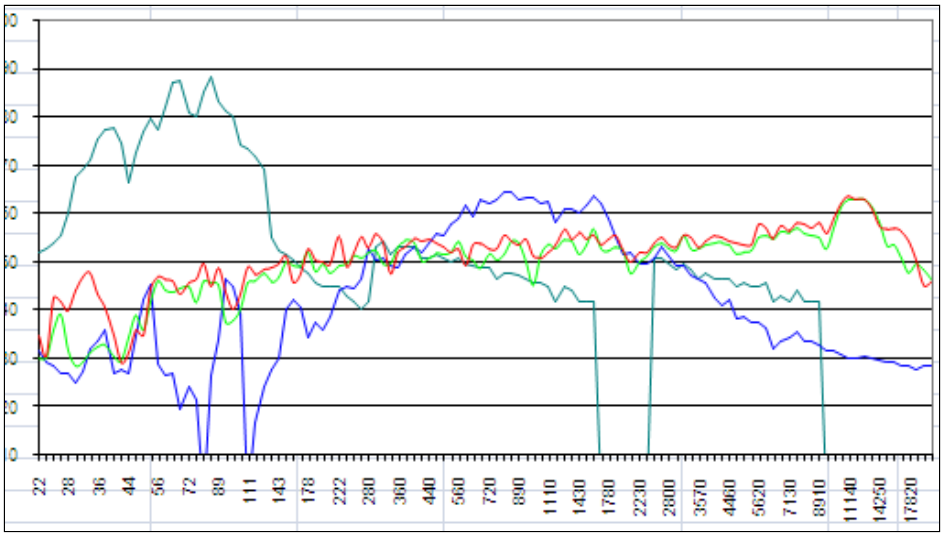
Score After Calibration: **A**

Element ***29***

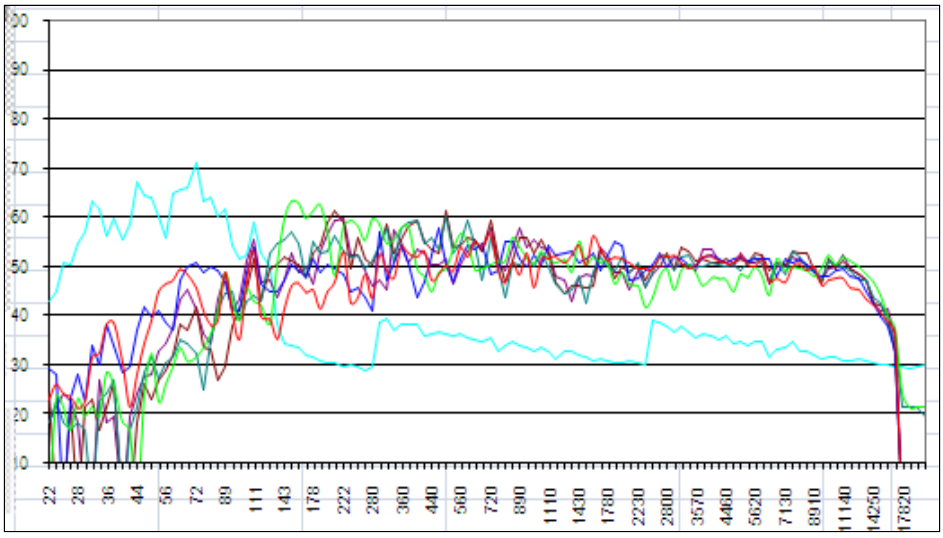
1/3RD OCTAVE FREQUENCY RESPONSE PLOT OF EACH CHANNEL AT THE PRIMARY LISTENING POSITION IS SMOOTH, AND RESEMBLES COMPOSITE NEAR FIELD MEASUREMENT WITH ALLOWANCES FOR DESIRED ACOUSTICAL EFFECTS.

Score: **B**

The 1/3 octave measurement of system response is a clear way to gauge calibration. We use 1/3 octave measurements because they give the best indication of significant problems versus non-issues. Not all bumps and dips seen on a high resolution frequency response plot are issues. A successful calibration will show a smooth plot with minor ups and downs less than 2 to 3 dB from band to band. A desirable plot will also show a sloping downward in level for frequencies above 10,000 Hz. Undesirable fluctuations in level are audible by comparison and therefore are an indication that some calibration adjustment is necessary.



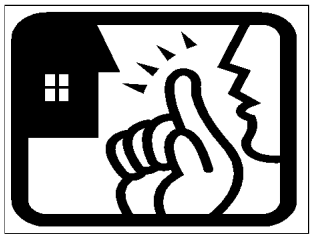
RECOMMENDATION: A 1/3rd octave frequency response plot was conducted for each channel at the prinmary listening position, showing smooth responses in line with the near field plots.



Element ***32***

SYSTEM NOISE CRITERIA IS MEASURED AT NC 25 OR BELOW AT PRIMARY LISTENING POSITION.

Score Before Calibration: **A**



The direct sound impulse contains the essence of clarity and focus. Any ambient noise that competes in sound level with the direct sound reduces these qualities. As the noise level increases the dynamic range of the system decreases. Since we measure dynamic range as the difference between the loudest and the quietest sounds, ambient noise reduces our ability to hear the subtle sounds of any recording. While it may seem obvious to increase the volume to retain these sounds, the resulting sound level is not theatrically correct and possibly even annoyingly loud. In most cases, the increase in volume to hear quiet sounds extends the loudest passages past the systems capability to play effortlessly and results in chasing the , up and down, throughout a soundtrack.

RECOMMENDATION: The system noise criteria measured at NC 27 at the primary listening position which is very good, no further adjustments are necessary.

Result: No significant change in this element

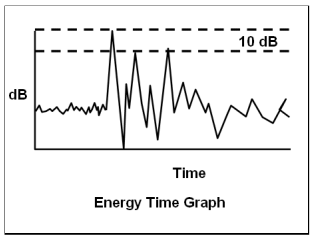
Score After Calibration: **A**

Element *33*

ENERGY TIME ANALYSIS AT PRIMARY LISTENING POSITION EXHIBITS A STRONG DIRECT SOUND LEVEL 10 dB LOUDER THAN INDIRECT SOUND LEVELS FOR FRONT LCR SPEAKERS.

Score: **A**

The energy time plot is a measurement of sound level over time. The first impulse detected is the direct sound signal. It contains the essence of sonic clarity and focus. It should be louder than any reflected impulses in order to preserve detailing, precise imaging, and intelligibility. The commonly accepted measure of success is that the direct sound level should be on the order of 10 dB louder than the reflected impulses arriving within the first 30 milliseconds. Reflections that are too loud can reduce focus and clarity. On the other hand, reflections that are too quiet do not benefit the system by adding a sense of spaciousness and envelopment. Improvement of this element ordinarily means making physical changes to room layout and wall coverings.



Energy Time Graph

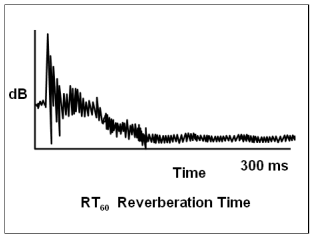
RECOMMENDATION: The energy time analysis at the primary listening position exhibited a strong direct sound level 10 dB louder than indirect sound levels for the front LCR speakers.

Element *39*

REVERBERATION TIME (RT60) OF SYSTEM IS NO LONGER THAN 400 MILLISECONDS AND NO LESS THAN 250 MILLISECONDS.

Score Before Calibration: **A**

The makeup of a room's furnishings and wall coverings combined with the volume of the space affect the length of time a sound can echo in a system. More absorptive rooms containing drapery, pillows and the like tend to have short reverberation times, meanwhile open floor plan rooms with many untreated windows or walls show longer times. Neither is optimal, but clearly a longer reverberation time is the more annoying acoustical problem. Most living rooms usually have sufficient absorption from furnishings to create a reasonable acoustical environment and the use of the RT60 as a calibration parameter in a small room is often not a reliable measurement anyway. However for larger spaces, the RT60 can be a very useful indicator toward the need for acoustical treatment.



RT_{60} Reverberation Time

RECOMMENDATION: The reverberation time (RT60) of the system was measured at 350 milliseconds which is acceptable.

Result: No significant change in this element

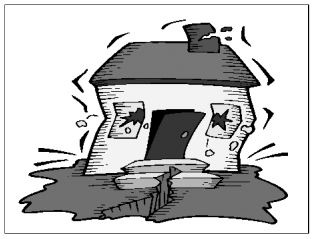
Score After Calibration: **A**

Element *40*

SYSTEM IS FREE OF VIBRATIONS AND COLORATIONS DUE TO SYMPATHETIC RESONANCE OF FURNISHINGS, FIXTURES, STRUCTURES OR OTHER OBJECTS.

Score Before Calibration: **A**

Sound is created by objects vibrating. In a listening room the vibrations should be coming from speakers not from anything else in the room. Often these unwanted vibrations are relatively innocuous and not easily detected since they only occur at higher sound levels. Yet when audible they remind the listener that they are in their own room and suspend the "suspension of disbelief". The occasional can light rattle or the vent vibrating is annoying yet less obvious resonances from cabinets and even poorly constructed walls or floors combine to reduce the clarity and dynamics of the performance. A well constructed and damped room is a significant benefit in the quest for high end sound quality.



RECOMMENDATION: The system was free of any vibrations and colorations due to sympathetic resonance of furnishings, fixtures, structures or other objects.

Result: No significant change in this element

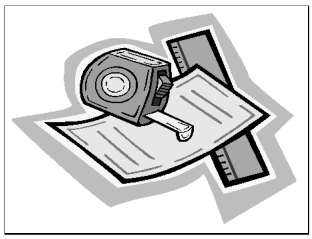
Score After Calibration: **A**

Element *41*

SYSTEM SPEAKER POSITIONS, LISTENER POSITIONS, TREATMENT LOCATIONS AND PROCESSOR SETTINGS HAVE BEEN RECORDED OR INCLUDED ON A DRAWING FOR FUTURE REFERENCE.

Score Before Calibration: **A**

The process of calibrating a system requires much time and effort. The results of the process are also based upon the physical layout of the room and repeatable adjustments on electronic components. Once the calibration parameters have been obtained, they should be recorded to expedite any future adjustments or touch-ups.



RECOMMENDATION: System speaker positions, listener positions and processor settings have been recorded for future reference.

Result: No significant change in this element

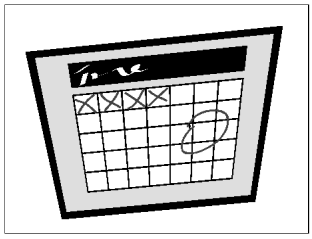
Score After Calibration: **A**

Element *42*

A REGULAR CALIBRATION MAINTENANCE SCHEDULE HAS BEEN ESTABLISHED TO ASSURE LONG TERM HIGH PERFORMANCE.

Score Before Calibration: **A**

Unless the system remains scrupulously untouched including speaker positions, listeners' positions, or component settings, it is prone to come out of calibration. This reality is often the cause of misgivings by clients after owning a system for a period of time. These sometimes subtle and sometimes obvious changes erode the sound quality to a clearly audible degree. Yet because the maladjustments are often incremental the listener is not immediately struck with the problem. A yearly re-calibration is highly recommended and the return of the system to its calibrated state usually reinvigorates the systems use and listener appreciation.



RECOMMENDATION: A regular calibration maintenance schedule has been established to assure long term high performance.

Result: No significant change in this element

Score After Calibration: **A**