Audyssey Setup Guide

Created (compiled) by giomania


Disclaimer: The following procedures may not work in all cases, as there are too many variables to account for in this document. If you feel further assistance is required, please visit the AVS Forum Official Audyssey thread. Last, this document has been proven to lead to Audyssey Obsessiveness Syndrome (AOS) in some susceptible Audysseyphiles.

I. Room Setup

A. Lower the noise floor of the room (<45dBA) by turning off the HVAC system, projector, etc.

II. Subwoofer Setup

A. Determine the optimal placement of the subwoofer within your room using common accepted practices. (location, location, location)

   1. Here are some useful references for subwoofer setup:

B. Disable the Low-Pass Filter (LPF) on the subwoofer, if allowed.

   1. Disabling the LPF will result in more accurate subwoofer distance measurements.
   2. If the LPF cannot be disabled, set it to the highest frequency allowed.

C. Ensure the subwoofer(s) are at least 3 – 5 inches (7 – 13 cm) from the wall.

   1. Reverberating walls may result in inaccurate subwoofer distance measurements.

D. Set the subwoofer polarity (0 or 180 degrees), (+ or -) to “0” or “+”.

E. If the subwoofer has a phase control (in addition to the polarity control), set it at “0”.

   1. Phase controls on subwoofers apply "delay" at one frequency rather than the needed group delay that is frequency-independent. So, it is best to just leave them at “0”.

F. If the sub has an EQ system, you can use it to tame large peaks (see item 1 below) before calibrating with Audyssey, but this is generally not recommended. Most of these EQ systems only allow one measurement position, and therefore only correct the amplitude (volume) for one seating position. Audyssey adds the benefit of measuring in the time domain for multiple seating positions to create an acoustic bubble.
1. Narrow peaks or dips in the response below 100 Hz that are 1/3 or 1/6 of an octave wide can be improved—but not eliminated—by Audyssey MultEQ XT.
   a. In these situations, the built-in subwoofer EQ systems might be useful.
   b. The SVS AS-EQ1 and the Audyssey Sub Equalizer (introduced in 2009), have double the resolution of Audyssey MultEQ XT found in Audio-Video Receivers, which allows it to correct more narrow peaks and valleys in subwoofer response.

G. Calibrate the subwoofer volume

1. Newer Receivers (i.e. Denon AVR-4310 CI) have automated the subwoofer volume calibration process, making steps 2 – 8 below unnecessary. If you are fortunate enough to own one of these newer models, proceed to section III.

2. Set the volume control on the subwoofer at the middle of the adjustment range allowed.
   a. Please note this “starting point” may not work with all subwoofers.

3. Place the microphone at the first measurement position (see guidance in section V.) and proceed with the calibration process for the first measurement—until all speakers have been measured once.

4. After the first measurement process is complete, select "Calculate", then "Save" or "Store", then go to "Check Parameters".
   a. Audyssey will calculate the speaker distances and trim level settings from this first measurement.
   b. Each manufacturer has a slightly different interface, so the terminology may not exactly match.

5. Check the subwoofer trim level setting in the receiver / processor menu.
   a. If the subwoofers’ trim level is at the maximum limit of the cut (-) or boost (+) adjustment range allowed, you need to adjust the volume control on the subwoofer and repeat step #2. Specific instructions will follow.
   b. Trim adjustments are a tool used to achieve the goal of producing the same Sound Pressure Level (SPL) from each speaker / subwoofer in the system.
   c. For example, Denon receivers have a trim adjustment range from -12dB to +12dB.

6. If the subwoofer trim level is at the maximum boost (+), turn up the volume control on the subwoofer slightly and repeat step #2.

7. If the subwoofer trim level is at the maximum cut (-), turn down the volume control on the subwoofer slightly and repeat step #2.

8. A suggestion for tweakers is to set the subwoofer trim level in the range of ±3 dB.
   a. This is only a suggestion for the tweaker who likes to play around.
   b. Audyssey’s position is to perform steps 4 to 6 above.

• Note: This process is for checking the subwoofer trim levels only. After you have completed the subwoofer setup, be sure to start the measurement process over, following the guidance in section
V to use all six or eight measurement positions available.

III. Dual mono (LFE) Subwoofer Setup

A few receiver and processor models are able to apply individual Audyssey equalization curves to multiple subwoofers simultaneously. If you do not own one of these units, the SVS AS-EQ1 will apply individual Audyssey equalization curves to two subwoofers simultaneously. Alternatively, you can follow the below advice to have two subwoofers share one Audyssey equalization curve.

A. Place the subwoofers symmetrically within the room, if at all possible.

B. Place the subwoofers at identical distances from the primary listening position, if at all possible.
   1. When two subwoofers are driven as one unit, proper time alignment is critical.
   2. The two subwoofers will not be properly time aligned unless they have the same physical distance from the primary listening position.
   3. Adjusting the physical distance of the two subs effectively adjusts their time delay.

C. The above advice applies only to sealed rectangular rooms without any openings.

D. Follow the steps in subwoofer setup (section II.) for each subwoofer: Ensure the polarity settings are the same.

E. As an alternative to locating the subs at equal distances from the main listening position, you may insert an electronic device between the receiver / processor and the nearest subwoofer.
   1. This device should introduce a time delay such that its output sound reaches the main listening position at the same time as the farthest subwoofer.

F. Attempt to match the output level of both subwoofers.
   1. Use the receiver / processor internal LFE test tone while adjusting the volume control on the subwoofer to perform the following:
      2. Turn one subwoofer on, and adjust the output level to 80 dB using an SPL meter.
         a. Ensure the SPL meter is located where the first Audyssey measurement position will be taken (see section V.), and is set to “C” and “Slow”.
         b. If you do not have an SPL meter, adjust the level by ear.
   3. Turn off the first subwoofer, turn on the second subwoofer, and repeat the procedure.
   4. Turn on both subwoofers and calibrate with Audyssey.

IV. Microphone Setup

A. Use the microphone that came with the unit.
1. Use of a microphone from another make or model will cause incorrect frequency response measurements because of different internal calibration.

B. Mount the microphone on a boom arm microphone stand with an adapter or a camera tripod.

   1. While more expensive, the floor-standing boom arm microphone stand allows more precise microphone placement and the possible reduction or elimination of mechanical vibrations, which can affect low-frequency measurements. The boom arm microphone stand rests on the floor, while a camera tripod typically rests on the seat(s).
      a. Search the web for “On Stage CM-01” to see one microphone stand adapter.

   2. If possible, place the microphone stand behind the seat with the boom arm extending forward so there will be no obstructions between the microphone and the speakers.
      a. The microphone stand and boom arm cause reflections at high frequencies, so it is best to keep it out of the way; at least for the front speaker measurements.

C. Point the microphone at the ceiling.

D. Place the microphone at ear height when seated.

   1. During the measurement process, do not vary the height of the microphone more than a few inches relative to the first measured position.

   2. If you have large dipole line-source speakers (Soundlabs, Innersound/Sanders, Magnepan, Martin Logan, etc.), or unusually tall speakers, please visit AVS member JonFo’s addendum on Audyssey setup and measurements for large dipole speakers, located here: http://www.martinloganowners.com/~tdacquis/forum/showthread.php?t=9401

E. If the seat back is higher than ear height, ensure the microphone is raised above the seat back.

   1. Positioning the microphone above the seat back will eliminate additional reflections.

   2. For recliner chairs, you can recline the seat (lower the back) to minimize the reflections.

V. Microphone Placement (Measurement Positions)

   A. Use the maximum amount of measurement positions allowed by the Audyssey version.

      1. If you are using MultEQ or MultEQ XT you should use all six or eight measurement positions available.

   B. Avoid taking measurements too far off to the side (near room boundaries) and / or outside the front Left and Right loudspeakers (off-axis), even if seats are located there.

      1. Frequency response in these locations will exhibit reduced high frequencies.

      2. Audyssey would adjust the room correction filters according to this measured response, resulting in unnecessary compensation.
C. Avoid taking measurements too close to the back wall, even if the only seating is located there.

   1. Move the microphone at least 1 foot (30 cm) from the back wall before measuring.

D. Measure behind the main seating area—at ear height, obviously—if you can.

   1. If the main seating area is out in the room, and you can measure behind it while keeping the microphone at least 1 foot (30 cm) from the back wall, you should do it. The idea is to "surround" the seating area with measurements.

E. For the first measurement, place the microphone at ear height in the primary seat/listening position, where the listener's head would be positioned.

   1. Audyssey uses the first measurement position to calculate the speaker/subwoofer level and time delay (aka distance) settings, so the microphone should be placed in the primary seating position.

   2. Distance measurements are really time measurements that ensure temporal coherence. It is a critical part of calibration because—without it—you have frequencies arriving at different times: This is called non-constant group delay, and is a form of distortion. The distances are calculated so the sounds from all speakers and subwoofers arrive at the first measurement position at the same time.

F. Most seating configurations can utilize the following microphone placement methodology:

   1. The first microphone position (#1) must always be where your head is located.

   2. For the remainder of the measurements, use the approximate pattern in the below diagram to surround your listening area, while ensuring you follow the guidance above.

   3. After the first measurement, the order in which you make the subsequent measurements does not matter: The diagram below only serves to ensure each location is measured.

   4. The distance between the measurement positions is variable, and they do not require measurement. The basic idea is to surround the listening area with measurements.

   5. In general, Audyssey does not recommend putting the microphone in "every seat", except (possibly) in a dedicated theater with rows. In typical living rooms, some seats are positioned either off-axis, too close to a room boundary, or both.

   6. Feel free to experiment with other microphone placement patterns. Just ensure you follow the guidance in sections IV and V. The basic goal is to surround the listener(s) with measurements to create an acoustic bubble.

   7. If you have additional microphone placement questions, visit the Official Audyssey thread on AVS Forum; please see the link at the beginning of this document.
The red dots (numbers 1 – 6) represent microphone placement if you only take 6 measurements (MultEQ).

The green dots (numbers 7 – 8) represent two additional microphone placements when you take 8 measurements (MultEQ XT).

The blue dots (numbers 9 – 12) represent four additional microphone placements when you take 12 measurements (MultEQ Pro).

If the seating area is close to—or touching—the rear wall, and would not allow you to keep the microphone at least 1 foot (30 cm) from rear wall, you may need to relocate measurements 7 & 8 forward of measurements 1 – 3. Specifically, measurement 7 could be located at the diagonal intersection of the square formed by measurements 1,3,4, and 5. Measurement 8 could be located at the diagonal intersection of the square formed by measurements 1,2,5, and 6.
VI. During Calibration

A. Be prepared for the “chirp” measurements, as they are quite loud, and can startle you.

B. Do not make any noise during the “chirp” measurements.

   1. Audyssey measures for a few milliseconds (ms) after each “chirp” is finished, but then has to wait for the DSP to calculate, so the microphone is not active until a few ms before the next set of chirps.

C. Do not stand in between the speaker and the microphone or anywhere that the sound is either reflected off of—or absorbed by—your body.

   1. The natural room acoustics must not be substantially affected.

D. If a phase warning is shown, check the speaker wiring, and press “Skip” to continue the calibration.

VII. After Calibration

A. Raise the speaker crossover settings, if desired.

   1. Raising the crossover frequency from the calibrated setting does not affect the channel correction implemented by Audyssey.

   2. Lowering the crossover frequency from the calibrated setting is not recommended.
      a. Audyssey will not provide correction to the satellite speakers lower than the frequency it measures as the -3 dB point.

   3. Audyssey recommends that all speakers be set to “Small” (i.e. not Full Band) by selecting a crossover frequency. This will re-direct the frequencies below the crossover point to the subwoofer, resulting in improved headroom for the main amplifier and 8x higher MultEQ filter resolution in the subwoofer channel (e.g. flatter bass).
      a. Setting the speakers to “Small” with a 60 Hz – 80 Hz crossover is a good starting point, assuming the post-calibration crossover setting is 60 Hz or lower.

   4. For additional details about the crossover selection process, see “Note 1” below.

B. Raise the low-pass filter (LPF) setting—usually incorrectly identified as a crossover—of the LFE subwoofer in the receiver / processor to 120Hz, if allowed.

C. If the speaker distance settings (not the subwoofer) were not measured accurately, and are markedly different from what you get with a tape measure, start over.

   1. Incorrect distance measurements for the satellite speakers indicate a procedural error, and the associated EQ results are likely to be poor.
      a. If the recommendations in sections IV and V were followed, you may need to change some physical aspect of the measurement setup.
D. Do not change the distance setting of the subwoofer, unless you have read and completely understood this section: The subwoofer / satellite speaker time alignment blend is based on this setting.

1. Inaccurate subwoofer distance measurements usually occur when a subwoofer’s Low-Pass Filter (LPF) is active, or when using subwoofer equalization systems.
   a. The LPF—by nature of its design—introduces additional delay to the signal.
   b. Audyssey measures this signal delay and increases the subwoofer distance setting to compensate for it.

2. If the distance measured by Audyssey is greater than the physical distance, there is a signal delay between the generated “pulse” and the arrival of the resultant response at the microphone. This is a common anomaly due to circuitry (e.g. LPF, EQ) in subwoofers.

3. If the distance measured by Audyssey is less than the physical distance, here are some possible causes:
   a. Holding the microphone in your hand.
   b. Use of a subwoofer with a two-driver push-pull configuration. This is an unexplained phenomenon which has been noted by Audyssey.
   c. Tactile transducers (e.g. Crowson, Buttkicker, etc.) left on when measuring.
   d. Acoustical low-frequency noise in the room (e.g. projector fan, cable hum).
   e. Electrical noise coming from another system component. The most common offender is the cable or other set-top box (STB). In several cases, disconnecting the STB from the system solved the problem.
   f. The power supply of a computer connected to the same electrical circuit.
   g. If none of the above situations apply to your problem, see “Note 2” below.
   h. If you are certain the above scenarios (a. – g.) do not apply to your situation, then you can manually set the distance of the subwoofer in the AVR to the actual physical distance. Ensure you measure from the center of the subwoofer driver to the height of the microphone tip. If you would like to ensure this is the correct action to take, visit the Official Audyssey thread on AVS Forum for a thorough dissection of your problem; please see the link at the beginning of this document.

E. Disable any Night Modes, Dynamic Range Compression (DRC), and Dynamic Compression (D. Comp) in the receiver / processor as well as the DVD / BD player.

1. If these features are not disabled, they could possibly cause adverse interaction with Dynamic EQ and Dynamic Volume.

2. You may need to temporarily turn off MultEQ to access these parameters in your receiver / processor.

3. You may also need to select a specific soundtrack type or listening mode before a given parameter will appear in the menu for adjustment; check the manual to be certain.

F. If your receiver / processor has the THX Loudness Plus feature, turn it off if you plan to use Dynamic Volume.
G. Select one of the Audyssey target curves. Note that in some receivers / processors, the target curve selection is automatic as explained in #3 below.

1. MultEQ creates filters that correct the frequency response of your speakers to a specific target curve. These target curves are called: (“Audyssey” or “Audyssey Reference”) and (“Audyssey Flat”).
   a. The “Audyssey” or “Audyssey Reference” target curve is designed to translate film mixing room conditions to the home listening room. This curve is flat to 4 kHz, has a slight roll-off from 4kHz - 10 kHz (-6dB @ 10 kHz), and another additional roll-off from 10 kHz - 20 kHz (-6dB @ 20 kHz). This curve should be used for listening to movies in most cases.
      i. In a typical living room, the acoustical conditions require a flat curve up to a certain frequency, and then a roll-off. This roll-off allows the proper balancing of the direct and reverberant sound at high frequencies.
   b. The “Audyssey Flat” target curve has no roll-off. This curve should be used for movies if you are seated in the near field, if your room has a lot of high frequency absorption due to acoustic treatments, or if you are using THX Re-EQ.
   c. Audyssey research has found that listeners in most home environments are seated in the reverberant field. The mixing of most films (in post-production studios) is completed with the recording engineer seated in the near field. As a result, it is usually beneficial to use a high frequency roll-off (Audyssey or Audyssey Reference curve) to tame brightness. However, if you have an acoustically treated room and / or are seated relatively close to the front speakers, you may be located in the near field. Therefore, it may prove beneficial to try listening without a roll-off (Audyssey Flat curve) to see if there is an improvement in sound quality.

2. Re-Equalization technologies affect the target curve selection.
   a. One component of THX is called Re-EQ, which applies a high frequency shelf cut filter. When listening in THX mode with Re-EQ on, it is recommended to use the “Audyssey Flat” target curve.
   b. Some manufacturers have developed proprietary high frequency roll-off filters with various trade names; Denon’s “Cinema EQ”, for example. It is recommended to disable (turn off) such roll-off features so the “Audyssey” or “Audyssey Reference” target curve can operate properly.

3. The selection of Audyssey target curves is performed manually in some products (e.g. Denon, NAD, Marantz) and automatically in others (e.g., Onkyo).
   a. For products with manual selection follow the guidelines above.
   b. For products with automatic selection, the following rules apply:
      i. The “Audyssey” or “Audyssey Reference” target curve is selected after calibration.
      ii. The “Audyssey Flat” target curve is selected automatically when you switch to a THX listening mode.

4. Note: Music content is not produced with the same standards as film, so, it is difficult to predict which target curve to use. Audyssey recommends starting with the "Audyssey" or "Audyssey Reference" curve. In some cases, the "Audyssey Flat" curve might be preferable for music.
H. If desired, trim level adjustments can be made in the receiver / processor to boost subwoofer levels for those who prefer more bass output. While not recommended, some users have made trim level adjustments so that all speakers measure at 75 dB with an SPL meter (set at “C” and “Slow”) using the internal test tones. See “Note 3” and “Note 4” below.

1. Audyssey will monitor these changes.

2. The changes are monitored so that Audyssey and its features (Room correction curves, Dynamic EQ and Dynamic Volume, etc.) work as designed.

3. If you were to make changes to the settings on a subwoofer amplifier, Audyssey would have no knowledge of this, and those features would not operate as designed.

**Note 1 – Crossover Settings**

Audyssey MultEQ measures **in-room response** of each speaker, determining the lowest the frequency they can reasonably produce. This is known as the -3dB frequency point. The -3dB frequency point is used by the receiver / processor to calculate the speaker settings (Large / Small) and set the crossover points, if applicable. The bass management system in the receiver / processor then performs the high and low pass filtering centered at the crossover frequency. The important point is that **Audyssey does not set the crossovers**. Unfortunately, current receiver / processor models do not display or report the -3dB frequency point measured for each speaker. The only information available is whether or not the speaker was designated “Large” or “Small”, and any crossover point selected.

Receiver / processor manufacturers use a specific Frequency Decision Point (FDP) to classify speakers as “Large” (full-range) or “Small” (less than full-range). The selection of the FDP varies among manufacturers and models, but 40 Hz is becoming the standard. If the -3 dB frequency measured by Audyssey is below the FDP, the speaker is classified as “Large”. If the -3 dB frequency measured by Audyssey is above the FDP, the speaker is classified as “Small”, and a crossover frequency is selected.

Each receiver / processor has various crossover points from which to choose. Typically, the first crossover setting above the -3 dB point measured by Audyssey is chosen. For example: If your receiver has crossover settings of 40, 60, 80, 100 and 120 Hz, and the speaker is set to “Small” with an 80 Hz crossover, that is an indication the -3 dB point is somewhere between 60 and 80 Hz. Crossover selections in increments of 10 Hz are becoming more common, which allows greater flexibility.

**Note 2 – Issues which may affect subwoofer distance measurements**

After having followed the guidance in section IV and section VII, D., some users still have subwoofer distance measurements that are less than the physical distance. The theory is that mechanical coupling between the camera tripod or microphone stand and some vibrating surface is causing low-frequency vibrations to be transmitted through the flooring and/or seating to the microphone. These vibrations are interpreted as having arrived before the actual sound waves, perhaps because they travel faster through the flooring and/or seating faster than the sound waves travel through the air. The rubber pads on most stands are usually good enough to prevent this, but if any part of the camera tripod, microphone stand, or boom arm is touching a vibrating surface you could have coupling that is picked up by the microphone.

The result is that the subwoofer distance is calculated as too short. Also, the correction Audyssey applies may not be optimal, as this anomaly could fool Audyssey into thinking the subwoofer extends lower than
it actually does. Taught leather couches—prevalent in home theaters—are one probable cause, but it may
depend on the structural properties of the various materials. Put your research grant applications in now!
In all seriousness, the solution to this theoretical problem is to use a microphone stand with a boom arm
positioned so that it rests on the floor and does not touch the seat or any other resonant surface. This
solution has corrected the anomaly for some users.

**Note 3 – Trim Level Settings**

Before adjusting the trim settings, please understand that producing a calibrated setting other than 75 dB
Sound Pressure Level (SPL) results in reference level being achieved with the master volume set to
something other than “0”. Further, Audyssey microphones are specified with a ± 2 dB maximum
sensitivity tolerance. So, in the worst case scenario, the Audyssey microphone would be 2 dB “off”,
which is more accurate than most popular consumer-level SPL meters. Consumer-level SPL meters are
usually very inaccurate when measuring subwoofers. You have been warned.

**Note 4 – Reference Versus Preference**

A common misunderstanding about Audyssey stems from differences between reference and preference.
It is really important to understand the basic goal of the Audyssey technology: To solve room acoustics
problems and the sound degradations they cause. The goal of Audyssey is not to shape the sound to your
preference, but rather to shape the sound to reference.

Audyssey measures your room and corrects the acoustical problems based on those measurements. The
reference point for this acoustical correction is based upon the only known standard: The mixing room
calibration curve used in all film production, and some—but not all—music production.

Assuming there are no problems during the calibration process, what you end up with is a reference
calibration. If you have some personal sound preferences, these are outside of what Audyssey is
responsible for. Some people want more bass, while others complain there is too much bass. Some
people want flat high frequencies, while others do not. These variances represent the difference between
reference and preference.