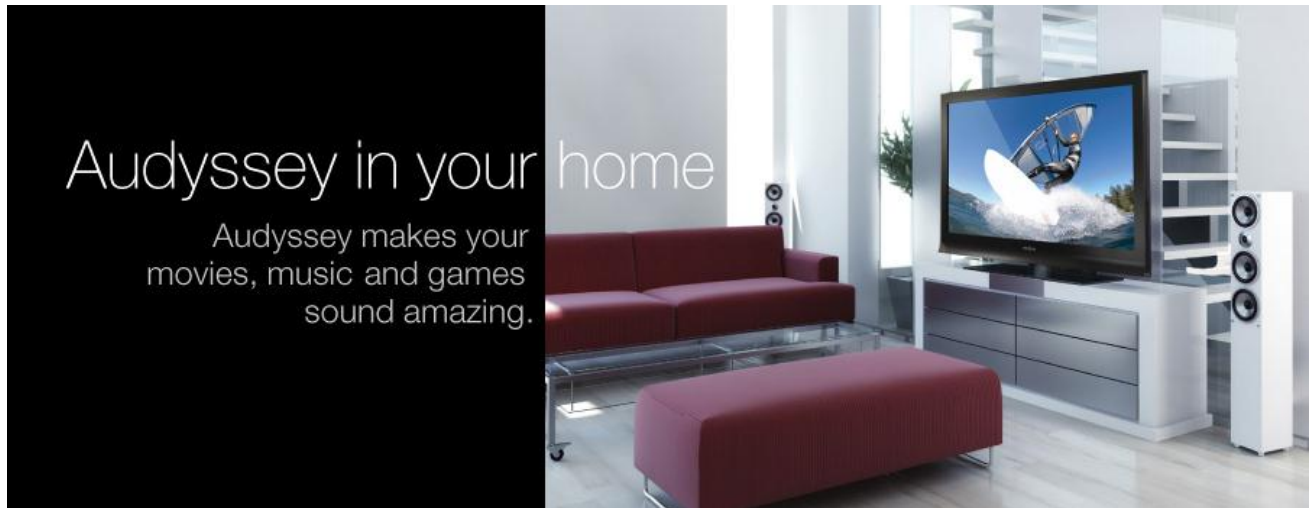


## Audyssey FAQ sheet



### **Who Is Audyssey?**

#### **From the engineer who developed THX**

##### **Professor Tomlinson Holman, Chief Scientist**

- Professor at the USC School of Cinematic Arts and the Viterbi School of Engineering.
- Over 40 years of audio industry experience
- Originally Chief Engineer for the Advent Corporation
- For his work at Lucasfilm Ltd in developing the THX Sound System Tomlinson Holman won an Academy Award

##### **Professor Chris Kyriakakis , Chief Technology Officer**

- Professor of Audio Signal Processing at the University of Southern California's Viterbi School of Engineering.
- He is the founder and Director of the USC Immersive Audio Laboratory and has authored two books and more than 100 journal and conference publications.
- In 2006 he was the winner of the World Technology Network award for his work in immersive media.

### **What is Audyssey?**

Audyssey is an audio company that believes in great sound – the kind of sound that gets your heart pumping and spine tingling. We design and develop innovative technologies that make great sound possible by fixing the audio problems in your home, theater and car. Our technologies help your audio experience be as true as possible to the original studio recordings, movies and live performances.

### **Why do I need Audyssey technologies?**

Your home entertainment experience has many components: content (movies, music or television), hardware (amplifiers, speakers, television and players) and your room. Each component is unique and has unique audio problems. Our technologies help all of these things work in concert with each other for a better experience.

## ***Is Audyssey creating effects to improve my sound?***

No. There are audio processing companies that add effects to change the original sound, but Audyssey is in a different category. Each of our technologies targets a specific audio problem in your home, car or studio and fixes it to give you better sound quality.

## ***How do I know if I am using Audyssey?***

Make sure Audyssey is available in your audio product. If you have an audio video receiver (AVR) for your home theater system, check the front panel for the Audyssey logo.

Make sure Audyssey is ON. Our core technology, MultEQ, uses a microphone to set-up your system and fix the acoustical problems in your room. Some of our other technologies need to be enabled from the setup menu. Check your manual for details because every manufacturer implements their interface differently.

## ***Which Audyssey technologies do I need to set up or turn on?***

If your product has Audyssey 2EQ, MultEQ, MultEQ XT or MultEQ XT32, you need to complete a one time measurement to optimize the sound of your system in your room.

## ***What is room distortion and why do I need MultEQ?***

Room distortion is caused by reflections from walls and furniture in a room (or car). Sound from the loudspeakers reaches your ears directly, but also bounces off surfaces and is reflected. You hear these unwanted reflections a bit later than the direct sound and this causes distortion. MultEQ analyzes these reflections and corrects the problems they create. Movies, music and games sound the way they were created. Audyssey founders spent 6 years and \$6 million of university research to create MultEQ and solve the room distortion problem.

## ***What is the difference between the various versions of MultEQ?***

Audyssey room correction technology comes in four solutions: MultEQ XT32, MultEQ XT, MultEQ and 2EQ. While they are all built on the same core science, each is designed to operate within the constraints of the available DSP processing power.



### ***MultEQ XT32***

: Our newest and most accurate room correction solution with more than ten thousand individual control points allowing finer details of the room's problems to be captured and corrected. The ultra-high resolution filters are applied to all channels including the subwoofers, with the most obvious benefit being heard in the low frequency range where correction is needed the most.



### ***MultEQ XT***

: Our advanced resolution room correction solution with high resolution equalization filters for satellites and subwoofers.

**AUDYSSEY**  
MULTEQ

**MultEQ**

: Our standard resolution room correction solution that uses mid-level resolution filters for satellites and subwoofers.

**AUDYSSEY**  
2EQ

**2EQ**

: Our basic resolution room correction solution that uses basic resolution filters for the satellites, but does not apply a filter to the subwoofers.

**MultEQ comparison chart**

Features	MultEQ XT32	MultEQ XT	MultEQ	2EQ
Filter resolution (satellites)	512x	16x	2x	x
Filter resolution (subwoofer)	512x	128x	128x	N/A
Number of Measurement Positions	8*	8*	6	3
Adaptive Low Frequency Correction	Yes	Yes	Yes	N/A
Crossover, Polarity, Delays, Levels	Yes	Yes	Yes	Yes

**Can I use any mic for MultEQ? Can I use a mic from my previous AVR on my new AVR?**

No. The Audyssey mic that was included with your AVR has been specially calibrated to your AVR model. Using another microphone for your MultEQ calibration will not produce accurate results. If you cannot find the microphone that was included with your AVR, contact the manufacturer for a replacement.

**What makes MultEQ work when so many others have tried to solve this problem for decades?**

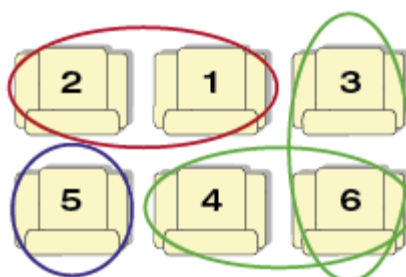
MultEQ is different from the many systems in the past because of two differentiators:

1. The way it measures your room
2. By correcting both time and frequency problems

In terms of methods for calibration measurements, there are two types of systems out there today:

1. Those that attempt to correct for only one seat in the room. This typically makes other seats in the room sound worse because a single measurement does not provide an accurate representation of the problems of the entire room.
2. Some EQ systems do try to correct for multiple positions. They simply average the measurement results that they gather. Averaging tends to smooth out common acoustical problems, and therefore doesn't fix them. For example, if there is a peak at 200 Hz in one seat and a dip at 200 Hz in another seat (typical room), then the two measurements average each other out and there is no correction attempted.

In either case, these systems only attempt to correct frequency response problems and not time domain problems and this leaves a big part of the problem unsolved.



Unique measurement and calculation system makes great sound possible.

### ***How does MultEQ measure your room differently?***

MultEQ looks at patterns in the time domain responses and classifies them into clusters based on the similarities in those patterns, typically in 3-5 groups. A representative response is created from each cluster, and a final response is then created from grouping the representatives. That response is then used to create the EQ filter. It is a complicated process that is based on the complex mathematics of pattern recognition and fuzzy logic. But there is nothing fuzzy about the results. If you want to know more, we offer copies of selected publications we have written for technical conferences.

### ***Time and Frequency correction:***

1. The time domain is where many of the problems reside. Parametric and graphic equalizers can only correct for the frequency response and do so in a very coarse manner because they have limited resolution (bands).
2. Further, whether they have fixed or adjustable bands it does not matter because bands cause phase problems that most people hear as "ringing" or "smearing." This is why, after thirty plus years of trying this method most people don't like the results and turn it off.

### ***How does MultEQ address time and frequency problems?***

MultEQ filters start in the time domain. They are not just a few parametric bands. Instead they use several hundred points to represent the room response in both the frequency and time domains. The trick is to use enough filter points to get the needed resolution, but not so many that it overwhelms the processor inside the audio component. So, we came up with a way to reduce the number of points without sacrificing accuracy and a way to provide more filter power at lower frequencies where it is needed the most. MultEQ can correct 8 channels by using only a fraction of a single DSP

chip. This gives you the best of both worlds: time and frequency correction. Result — room correction that works for the first time ever.

### ***What about calibrating my system?***

In addition to all of our very complex EQ work, we also do the simple things really well. During step 1 above, MultEQ checks the absolute polarity of your system and tells you if any speakers are out of polarity (the + - wiring problem), measures the acoustical distance (within a 1/4 inch) to each speaker and sets the proper level trims for all channels including the subwoofer. Finally, it finds the optimum crossover frequency between each satellite channel and the subwoofer(s) and provides that information to the bass management system.

### ***What is a target curve?***

Once the room measurements are completed, MultEQ calculates a filter for each loudspeaker channel including the subwoofer. The role of these filters is to achieve a particular frequency response within the entire listening area for each loudspeaker. This curve is determined based on several acoustical and program material considerations and is called a “target” or “calibration” curve.

### ***What target curves does MultEQ use?***

Contrary to popular belief, a target curve that is flat from 20 Hz to 20 kHz is not always the one that will produce the correct sound. There are several reasons for this including the fact that loudspeakers are much more directional at high frequencies than they are at low frequencies. This means that the balance of direct and room sound is very different at the high and low ends of the frequency spectrum. In Denon A/V receivers equipped with MultEQ, you have a choice of (4) listening target curves, or ‘modes’; please note for different source inputs, your preferred listening mode is remembered in Personal Memory Plus. These are:

- **The ‘Audyssey’ target curve** setting makes the appropriate correction at high frequencies to alleviate this problem. A slight roll-off is introduced that restores the balance between direct and reflected sound.
- **The ‘Flat’ setting** uses the MultEQ filters in the same way as the Audyssey curve, but it does not apply a high frequency roll-off. This setting is appropriate for very small or highly treated rooms in which the listener is seated quite close to the loudspeakers. It is also recommended for all rooms when the receiver is in THX processing mode. This allows THX re-equalization to operate exactly as it was intended. to
- **The ‘Front Bypass’ setting** uses the MultEQ filters that were calculated for the entire listening area, but it does not apply any filtering to the front left and right loudspeakers. The average measured response from the front left and right loudspeakers is used as the target curve for the remaining loudspeakers in the system. The subwoofer in this case is equalized to flat as is the case for all the settings described above.
- **Finally, the ‘Manual’ setting** is a traditional Graphic equalizer that does not use the MultEQ filters. However the ‘base curve’ that was measured during the Auto Setup process, can be copied to the Graphic EQ, where you can then make adjustments to your personal tastes, again no other properties of MultEQ are applied with this setting.

### ***Why does MultEQ correct beyond 300 Hz?***

There is a belief that room correction should only be applied to frequencies below 300 Hz or so because that is the frequency range in which most of the room problems occur. This belief is based on an inherent assumption that a properly designed loudspeaker will perform as desired at higher frequencies and thus require no correction. This is not at all contradictory to MultEQ. If the loudspeaker is in fact properly designed then no correction will be applied to it. One simple fact that the proponents of this theory seem to overlook is that even the best designed loudspeakers will suffer from artefacts at high frequencies produced by reflections from nearby flat surfaces such as plasma screens or

cabinets. MultEQ performs this kind of correction when it is needed to allow the loudspeaker to achieve the performance it was designed to have.

### ***My speakers are wired correctly, why does MultEQ give a “Phase” error?***

MultEQ detects absolute phase for each loudspeaker. Some loudspeakers are designed with intentional phase reversals in the drivers in order to address crossover problems. MultEQ will detect that and report an error. The best course of action is to simply check the wiring and press “Skip” if it is correct. MultEQ simply reports a possible wiring reversal; it does not automatically switch the phase.

### ***My subwoofer is physically closer than the distance reported by MultEQ. Why?***

Many powered subwoofers do not provide the capability to defeat the built-in low-pass filter. These filters, by their nature, introduce additional delay in the signal and MultEQ finds that and reports it. The optimum solution is to turn the filters off (often called “LFE mode” in subwoofers). If that is not possible, set the low pass frequency to the highest possible setting and leave the distance reported as it. MultEQ will compensate for the added delay and time align the subwoofer to the satellite channels so that the optimum blend is achieved.

### ***How many listening locations can be measured?***

The equalization performance increases with the number of measurements. Audyssey recommends a minimum of 4 with most rooms performing best with 6 measurements. The maximum number of measurements is limited by the available memory in the receiver or controller and in some products can go up to 8. Depending on the model of Denon A/V receiver, the number of points that can be measured is the only difference in the MultEQ system.

### ***Does the microphone have to be placed in each seat?***

No. The ideal calibration consists of 6–8 measurements that encompass the listening area. It is important to have the microphone in the “main” listening position for the first measurement so that the delays are calculated correctly. After that, the mic should be moved around so that it covers an area within which listeners will be seated.

### ***Is the supplied Denon microphone calibrated?***

Yes, the Denon microphone is calibrated to a ¼” industry-standard measurement microphone. The correction is applied to the measurements as they are being taken. It is important to use ONLY the microphone that comes with the Denon A/V receiver, as the calibration curve built-in to the receiver is specific to that microphone. It is also critical to point the microphone upwards and to place it at ear height. Any other microphone will have different characteristics and thus will not produce the right results.

### ***Does MultEQ eliminate the need for acoustic treatment?***

No. Although MultEQ will improve sound significantly in untreated rooms, a properly treated room calibrated with MultEQ can achieve stunning results throughout the listening area.

### ***How well does MultEQ work at low frequencies?***

This is one of the unique strengths of MultEQ. Room correction methods based on parametric equalization do not have enough bands or processing power to apply correction in the bass frequency range. MultEQ uses a unique implementation of FIR filters that achieves very good resolution at frequencies below those that standard FIR filters can reach. The resolution of the MultEQ filters varies with frequency and this allocates more of the filter correction power where it is needed the most: in the lower frequencies.

### ***Does MultEQ compensate for loudspeakers placed behind a projector screen?***

If the calibration is performed with the screen in place, MultEQ will automatically create filters for behind-the-screen loudspeakers that compensate for the screen loss.

***What happens to the MultEQ settings when the parameters are changed?***

MultEQ corrects for room acoustical problems. Changes in the tone controls do not change the filter performance. They do change the tonal balance based on the preferences of the customer. The benefit of MultEQ is that it allows a customer (or installer) tone control setting to work on all program material in a much more predictable way than it would on an un-calibrated system. Changes made to the crossover frequency or “small” and “large” settings of the loudspeakers do not affect the performance of the MultEQ filters.

***Is there a danger of overdriving the loudspeakers by using MultEQ?***

No, MultEQ filters are calculated by taking into account the capability of the loudspeaker and the overall gain structure of the system. Limits in correction are imposed at each frequency to prevent the loudspeakers from being overdriven.

***How can the performance of MultEQ be measured?***

Proper frequency response measurement requires the right equipment. This includes a calibrated ¼” microphone and software that can perform averaging over time and space. Unfortunately, many of the programs available on the internet or elsewhere do not perform room measurements correctly and this can give rise to misleading results. For example, many only allow a single microphone position and do not perform time averaging. The simple solution of using a test disc with sinusoidal tones and a sound pressure level meter is also inappropriate for measuring room responses because of the sensitivity of sinusoids to standing waves

Audyssey version	Denon AV Receiver
MultEQXT 32	AVR4311
MultEQXT	AVR3312, AVR2312 & AVR1912
MultEQ	AVR1612
2EQ	Not applicable

Reference [www.audyssey.com](http://www.audyssey.com)