

## Comparing the MC-12HD and RV-5/MV-5 EQ Calibrations

The Automatic Speaker and EQ calibrations are key features in select Lexicon products. While both were designed to improve the overall listening experience and help expedite setup times, the RV-5/MV-5 and the MC-12HD automated calibrations perform in very different ways.

In short, the RV-5/MV-5 calibration provides system equalization and bass correction, adjusting the frequency response of the outputs to provide a balanced overall system. The MC-12HD Room EQ calibration addresses the problem of room modes, applying specific parametric filters to the outputs and thus accommodating for the resonances present in the listening space.

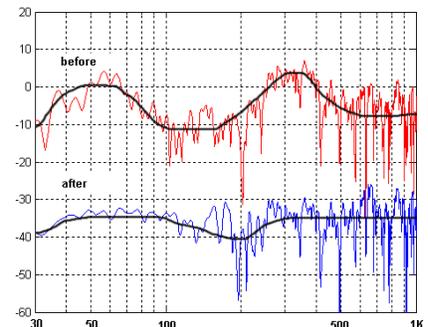
In the actual performance of the calibration, the products differ as well. While both are automated, the RV-5/MV-5 calibration requires the interaction of the user during the procedure. Whereas, once the initial setup and preparation are complete, the MC-12HD automatically performs the whole calibration without user interaction.

### RV-5/MV-5 Autocal Calibration

The RV-5/MV-5 Autocal Calibration performs system equalization and bass correction using a single microphone. However, unlike most equalization systems that simply knock down the peaks in the response, the RV-5/MV-5 calibrates the system more intelligently – compensating for frequency response aberrations, varied speaker performance, and balancing the entire system for the best overall results.

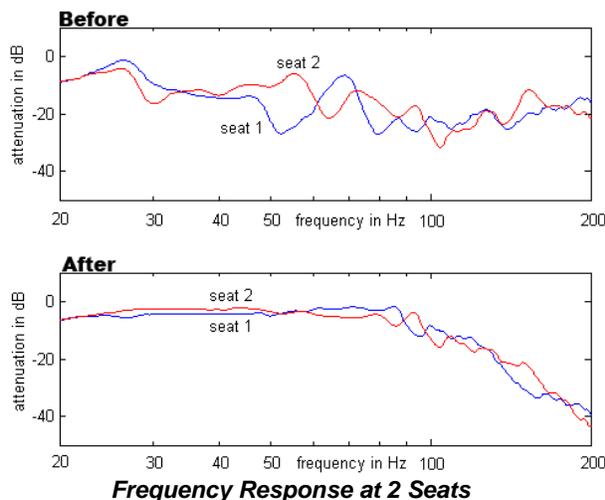
The main features of the RV-5/MV-5 calibration are:

- to reduce the audible differences caused by using low-quality speakers, or mixed speaker brands within the surround system
- to equalize the output of the system to improve stereo imaging and precision
- to reduce timbre differences between the left, right, and center sound due to placement and reflecting surfaces
- to equalize low-frequency response with high resolution within a reasonably large listening area
- to set the distance, level, and crossover for each speaker
- to provide subwoofer, mid-frequency, and high-frequency adjustments from 20 Hz to 20 kHz using three distinctively separate calibration routines



**Calibration Results Below 1 kHz**

In the diagram below, note the consistency between Seat 1 and Seat 2, the much smoother overall response, and the roll-off as the frequency increases.

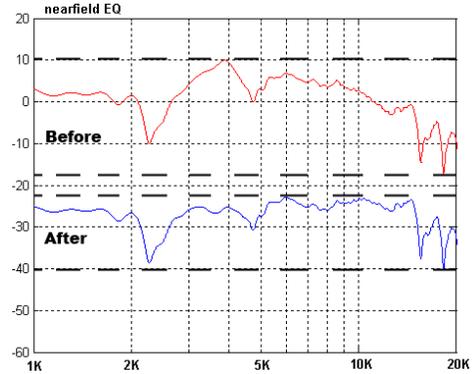


**Frequency Response at 2 Seats**

For surround systems with two subwoofers, the calibration equalizes the listening area between two listening positions placed within a 10-foot area. The calibration measures the response from each subwoofer to each listening position and then equalizes the system so that the bass response between those two locations is flat. This calibration is very useful since fluctuations in frequency vary considerably from seat to seat and adjusting for one position can make the other much worse. The subwoofer calibration algorithm guarantees flat responses, consistent over the entire area, with a defined roll-off at the upper end providing a transition to the main speakers.

The calibration has three separate routines – Far Field, Near Field, and Subwoofer Tests – all performed within the same calibration procedure. The Far Field test sets the speaker distances, crossovers, and output levels of each speaker in relation to the primary listening position and corrects the timbre of the direct sound field and early reflections between 100 Hz and 1 kHz. The Near Field test corrects for loudspeaker deficiencies at frequencies above 1 kHz. The Subwoofer test suppresses the room response below 100 Hz within an area between the two Far Field microphone locations.

The end result of the calibration is a balanced system, with equalized speaker response times, improved stereo imaging and precision, and reduced sound coloration.



**Near Field Test Results**

### MC-12HD Calibration & Room EQ

The MC-12HD has two automatic calibration procedures – one performs speaker output levels and distance calibrations, while the other performs the Room EQ calibration. The Room EQ calibration, which is the calibration that this article discusses, uses four microphones to measure the acoustical characteristics and modal properties of the listening room. In addition, the Room EQ calibration measures and calibrates for low frequencies - from 19 Hz to 150 Hz – making it very effective at treating problem resonances.

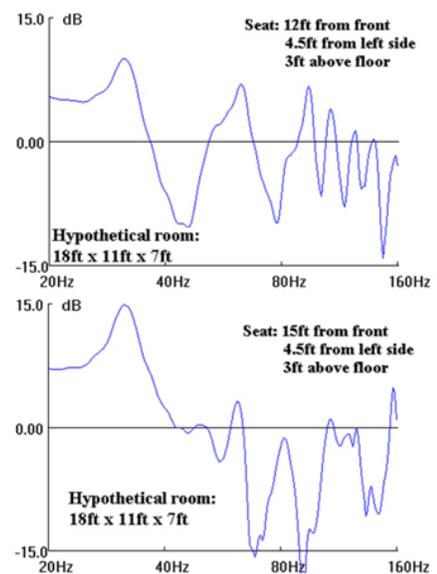
Using four microphones ensures that potential problem resonances aren't overlooked, since more than one listening position is measured, as well as providing additional data for evaluation. This acquired data then gives the MC-12HD a clearer picture of the room's acoustical properties, helping to ensure that ALL of the problem resonances are addressed.

### Understanding Room Modes

To understand the MC-12HD Room EQ calibration, you must first understand what room modes are and why the modal properties of the listening room have a significant impact on the sound quality of any surround system.

A listening room has surfaces that cause the sound waves from your loudspeakers to reflect back on themselves and interfere with each other, creating "room modes". The result is peaks and dips in the overall frequency response of the room, which can often sound unpleasant – too loud at some frequencies, too quiet at others, and the bass very "boomy" or even "flabby". These peaks and dips can also be very different for each seat in the listening space, adding further complication to any potential solution.

At high frequencies, these anomalies are difficult to predict because the wavelength of the sound is so short – sometimes just turning your head can cause the sound to change! But low frequency room modes have very long wavelengths and hence are predictable, and correctable. Proper speaker placement and acoustic treatment of the walls, ceiling, and floor can solve some of these problems, but usually additional equalization is needed to remove the more troublesome room modes.



**Frequency Response at 2 seats**

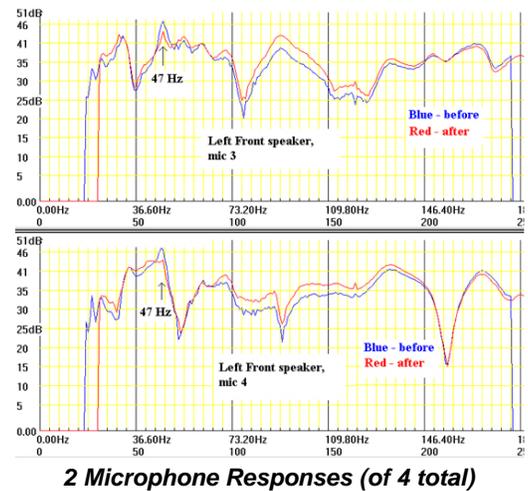
These room modes affect the way you hear in several ways – the most pronounced effect of room modes is to make certain frequencies too loud, but the most difficult to solve is the tendency of some resonances to linger in a room after the speaker has stopped reproducing them. A very strong resonance can linger as long as half a second and, in the worst cases, also has a distinct pitch.

These lingering resonances are not always noticed because the frequencies are so low; but they do present problems because a lingering sound often obscures the details in the following passages of the music or soundtrack. For example, the lingering sound from a kick drum could mask details of the following vocal passage. Trying to fix this problem by tweaking your audio controls doesn't provide a satisfactory solution because each can cause detail loss in other areas. The other problem is that each seat in the listening area potentially has different room modes affecting it.

### Correcting Room Modes Using the MC-12HD

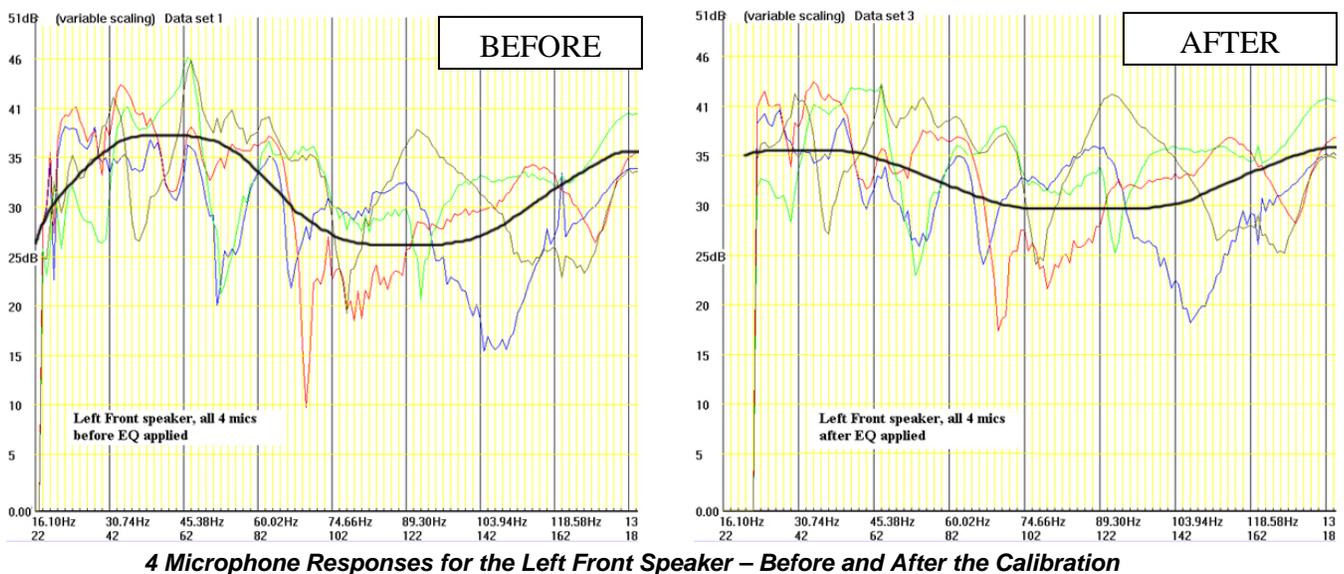
The only way to properly correct these lingering resonances is by applying the appropriate filter to each frequency where a problem room mode exists. The MC-12HD Room EQ calibration measures the impulse response of the room at frequencies between 19 Hz and 150 Hz; anything higher than 150 Hz has too small of a wavelength to accurately predict. The MC-12HD then analyzes the results and applies the proper parametric filters to neutralize the problem frequencies.

Unlike the typical solutions to these lingering resonances, such as using graphic equalizers or filters that are targeted to the peaks instead of to individual frequencies, the MC-12HD Room EQ calibration takes a different, innovative approach. The MC-12HD measures the decay time of the resonant frequency to within 0.732 Hz to identify the problem frequencies, and then treats each individual frequency with up to seven separate parametric filters.



The calibration then performs a second pass for each speaker to apply general response smoothing from 25 Hz to 250 Hz and to examine the spectrum for peaks and dips; the result of this second pass is generally a subtle tweaking of the initial calibration response. In addition, during this second pass, the calibration applies an additional filter at 120 Hz to provide a bass compensation boost.

The two graphs below demonstrate the effectiveness of the Room EQ calibration.



The main advantages of the MC-12HD Room EQ calibration are:

- Addresses what is important for the audio – the objective is not to make the numbers better, but to make the audio *sound* better.
- Resonances are a feature of any room – treating them helps the entire room as well as improving overall bass uniformity.
- The amount of correction can be adjusted by the listener.
- It's reliable and easy to calibrate – you can even use it to screen out external noise sources.

### Two Different Systems

There's really no fair way to compare the two EQ calibration systems. While the overall goal of each is to improve the audio performance of the system, the actual implementation of those goals is very different, as explained.

In summary, the RV-5/MV-5 calibration uses an internal sound pressure measurement and calibration system that automatically balances the speaker channel levels for optimum surround sound enjoyment – regardless of the speaker type or listening space conditions. In general, the RV-5 calibration is a simpler system, most useful for the casual listener. The MC-12HD neutralizes the room modes of the listening space and equalizes the room response to provide an overall smoother, better-sounding audio experience, regardless of the seating position. The MC-12HD is a more advanced system, specifically designed for the serious enthusiast.